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Abitibi's Report Reveals Encouraging Gains

Improvement of Financial Structure, Payment of Large Bank Loan and Decided Increase of Income Over Expenditure Shown In Annual Statement of G. T. Clarkson, Receiver and Manager—Net Operating Profits for 1934 Were $1,859,476—Total Now Available for Appropriation Amounts to $1,996,558

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., May 6, 1935—The annual statement of G. T. Clarkson, receiver and manager of the Abitibi Power and Paper Company, Ltd., whose head office is in Toronto, has been issued and contains several encouraging features, revealing a gain in finances, the payment of a large bank loan and a decided increase in income over expenditure. During the twelve months ending December 31, 1934, the excess of income over expenditure amounted to $953,928 as compared with $486,617 for the 3⅓ months ending December 31, 1932, and $549,945 for the year 1933. This was before depreciation and bond interest, but after charging off carrying charges of closed-down mills, losses of wholly owned subsidiaries and earnings of wholly owned subsidiaries, excepting G. H. Mead Company, the latter's earnings approximating $50,000.

At the date of receivership, the company was indebted to the Royal Bank of Canada in the sum of $4,261,038, on which were furnished as security certain deposits, inventories and the whole common stock of Provincial Paper, Ltd. The amount remaining payable on this account at the end of 1933 was $1,297,138 and when in November, 1934, the debt stood reduced to $618,475, the court authorized the receiver and manager to discharge the same by issue of receiver's certificate for $600,000 and payment of the balance in cash, following which the securities held by the bank were turned over to the receiver. As a result, excess current liabilities of the company as of December 31, 1933, of $619,504 were reduced to $243,931 at the end of 1934, representing an improvement of $375,573.

Such improvement in working position was obtained, notwithstanding that current assets were reduced in 1934 by certain expenditures, including improvement to mills, advances to subsidiaries, bank interest, inventories written down, etc., to a total of $746,923.

A comparative table shows that the receiver's obligations at the end of 1933 were $2,923,746, to which was added amount owing Royal Bank at that time, on advances prior to receivership of $1,297,138, or a total of $4,220,884. Against these were receiver's current assets of $2,544,648, securities held by the bank, less arbitrary value attached to common shares of Provincial Paper, Ltd., of $1,500,000, leaving current assets in the form of inventories and receivables $1,056,732. This made total current assets of $3,601,380. As at the end of 1934 receiver's current obligations were $4,325,232 and receiver's current assets $4,081,301.

The statement showing results from operations for 1934 shows sales of newsprint and pulp amounting to $9,371,840 and sales of power $329,940, making a total revenue of $9,701,780. Operating costs were $7,745,331, leaving a residue of $1,956,449, from which was taken $96,973 discount on United States funds, making net operating profits $1,859,476. To this was added interest, etc., of $137,082, making the total available for appropriations $1,996,558.

News of the Industry

The Thunder Bay Paper Company, Port Arthur, Ont., which is a subsidiary of the Abitibi Power and Paper Company, Toronto, showed in 1934 a loss of $347,713, after a partial shut-down and interest charges and the deficit carried forward was increased to $1,443,864. Current assets appear at $250,822 against current liabilities of $250,464. Fixed assets were $5,888,964 and other assets $62,957. Liabilities, other than current, include deferred, to Abitibi Company and receiver, $1,532,212; depreciation, $615,492; stock, $2,000,000; capital surplus, $3,253,438; less deficit, $1,448,864.

Members of the pulp and sulphite union and the papermakers union held a meeting lately at Sault Ste Marie, Ont., when the wage agreements with the Abitibi Power and Paper Company mills were extended until July 1. Although agreements usually are made on a yearly basis, union men state that the present newsprint price situation and the possibility of new labor laws in the United States accounted for the two months' extension. Next month there will be held in Toronto a conference between union men and the officials of the company to discuss further agreements. At present, pulp and sulphite workers are paid from 43 to 80 cents an hour on a six-hour day basis while papermakers earn from 59 cents to $1.61 an hour on the same basis.

It is expected that an announcement will shortly be forthcoming from the bondholders' protective committee of the Great Lakes Paper Company, Fort William, regarding completion of plans for reorganization. The hope is entertained that the first mortgage holders will be offered something better than payments of interest "if, as

(Continued on page 46)

Big Forestry Program for Middle Western States

One of Principal Purposes Is to Ensure Maintenance and Adequate Supply of Pulpwood for Pulp and Paper Mills—Compilation of Technical Data and Statistics First Step—R. B. Goodman, of Marinette, Wis., Appointed Chairman of Permanent Committee

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., May 6, 1935—Wisconsin, Michigan and Minnesota will be linked in a $25,000,000 forestry and conservation program, one of the principal purposes of which is to devise a plan to maintain an adequate supply of trees for the pulp and paper industry. This program, transcending all the extensive reforestation work already in the process of rapid development, was shaped into its preliminary stages at a Lake States Conservation Conference held at the United States Forest Products Laboratory at Madison, Wis., last week. Leading executives in the paper and lumber industries who have been dealing with this constantly growing problem for a long time, and government and conservation officials, and forestry experts were present.

The first step will be the compilation of technical data and statistics on which the enactment of the program can be built. Eight committees will begin research in the respective phases of policy and operations involved, among them such subjects as conservation, planning, public forestry, commercial forestry, land retirement, settler relocation, delinquent tax lands, and matters dealing with fish, game and recreation.

One of the committees will be a continuing body which will prepare findings of the conference and the committees for submission to the Governors of the three states. R. B. Goodman, of Marinette, Wis., capitalist interested in several paper mills and in extensive lumbering interests, is chairman of the permanent committee. Other members are Ralph M. Immell, Madison, Wis., chairman of the Wisconsin Conservation Commission; E. W. Tinker, of Milwaukee, United States forester for the Lake States section; S. T. Dana, Dean of the University of Michigan School of Forestry, and Henry Schmitz, Chief of the Division of Forestry of the University of Minnesota.

Technical Conferences Arranged

Two technical conferences, limited to representatives of member mills, will be conducted this summer by the Institute of Paper Chemistry, Appleton, Wis. The first will be held June 11 to 22. It will include lectures and laboratory work in fibre analysis and fiber micrometry. The laboratory work will include a thorough training in the use of the new stains for fiber analysis. The lectures will relate to the general subject of micrometry, including fiber lengths, particle size and other area measurements.

The second session, June 24 to July 3, will include lectures and some individual practical work on general photography and photomicography. One representative from each member mill may attend each session.

Power Supply Improvement

Improvement of water power supply on the Eau Claire River, supplying mills of the Eau Claire, Wis. district, will be brought about by the construction of a new dam at Augusta, Wis. The water level survey has been completed by S. P. Hall, civil engineer of Eau Claire. It provides for a 24-foot head of water at the dam, and a large artificial lake for water storage. A land survey is to be made in the area covered by the lake, after which arrangements will be made for the construction work.

With the level of Lake Winnebago at 18½ inches above the Fox River control dam at Menasha, Wis., sluice gates were reopened last week to prevent flooding. Paper mills are permitted to maintain a level of 21 inches, but lands are being flooded on the upper river, and pressure from the Association for the Relief of High Water forced remedial measures. The association held a meeting at Oshkosh last week at which its plans were given new impetus for a government survey of the Wolf river, tributary to the Fox, to determine whether storage reservoirs can be built to conserve the water supply during flood periods, for use at low water stages. A bill has been introduced in Congress by Representative M. K. Reilly asking the War Department to make a survey, and prepare plans and estimates of the cost of the work. The association also is proposing that nine million dollars be spent to deepen the Fox river channel to nine feet, and to develop navigation facilities on the Wisconsin river, so barge freight lines may be operated from the Fox River Valley to the Mississippi river. A fund of $5,000 is being raised to make a survey of freight rates to determine what benefits could be obtained from barge shipments.

News of the Industry

Employees of the paper and pulp mills in the Wisconsin River Valley are to have the benefit next fall of classes in pulp and paper making under an itinerant instructor, similar to the arrangement used for several years in the Fox River Valley. Plans were worked out by E. A. Holm, director of the Vocational school at Wausau, Wis., and E. E. Gunn, Jr., assistant state director of vocational education. The courses are financed largely by state and federal aid. A revolving schedule will be made in readiness for the fall season.

Credit unions of the paper mills at Neenah and Menasha, Wis., are organizing a Twin Cities chapter, composed of representatives of each who will function in legislative matters. The chapter also will be a clearing house for ideas and solution of problems. Walter Richter, of the Lakeview mill of the Kimberly-Clark Corporation is temporary chairman of the chapter. Other mills represented are Marathon Paper Mills Company, Gilbert Paper Company, George A. Whiting Paper Company, Neenah Paper Company, Bergstrom Paper Company, Banta Publishing Company, and the Badger-Globe and Main Office unions of the Kimberly-Clark Corporation.

The Neenah Paper Company bowling team of Neenah, Wis., came out with a six-game lead in the City League for the season. The team won 71 games and lost 43. Other mills represented in the league were Whiting Paper Company, Gilbert Paper Company, Bergstrom Paper Company, Marathon Paper Mills Company, and Sawyer Paper Company.

William E. Buchanan, sales manager of Appleton Wire Works, Appleton, Wis., has been honored with election as president of Appleton Chamber of Commerce. He is one of the youngest men who has held this position. He served on the board of directors during the last year, and also was a member of the Chamber's legislative committee. He is a son of G. E. Buchanan, secretary-treasurer of Appleton Wire Works.

New England Paper Mills Remarkably Active

Orders Reported Coming In So Fast That Opportunities for Stocking Supplies Are Lacking—Some Improvement Transpires In Wrapping Paper Market—Box Board Conditions Practically Unchanged—Several Grades of Paper Stock Firmer

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., May 6, 1935—A normal business prevailed as a whole in the Boston paper market during last week. With a fairly good April, some reporting a slight improvement for that month over March, and with May beginning well among at least a portion of the trade, the majority of paper merchants are cheerful. It is stated that mills are remarkably busy, with no opportunity for stocking supplies, orders are coming in so fast. At one fine paper house, it was said that many orders were booked ahead by this firm. With some, business was spotty and a few intimated that the demand was poor. The wrapping paper market was rather good. Some dealers in kraft specialties said that business could be better. The paper bag market was somewhat unsettled. Some reputable mills have recently issued lower prices to meet the chisellers. The fancy paper market was good. There was no great change in the box board market, with the demand hardly better than fair.

The paper stock market in some grades was fairly active, but values were unquotably changed. In old papers an average market prevailed in mixed papers and old newspapers. The demand for bagging was sustained, with prices strong. There was no special alteration in new and old domestic rags. Roofing rags were in moderate demand. The improved situation in foreign rags continued.

News of the Trade

A sales meeting was held at the office of the Storrs & Bement Company April 27, during which President C. A. Crocker, of the Crocker-McElwain Company, of Holyoke, Mass., and Messrs. Harrington and Dunbar of the same company spoke. Mr. Crocker reviewed his business associations with Storrs & Bement over a thirty-year period. He noted that when his company began operations in April, 1905, one of the first orders for bond paper was received from Storrs & Bement. The rest of the meeting was taken up in promoting the standard lines of the Crocker-McElwain Company. The fact was mentioned that in the last few years, the company had constantly improved the quality of all their standard lines. President William N. Stetson, Jr., of Storrs & Bement Company, presided.

The Annual Field Day of the New England Paper Merchants Association is to be held at the Longmeadow Country Club, Springfield, Mass., May 21. The meeting will be held in that city in order to give those living at distant points from Boston a better opportunity to attend the affair, an annual combination of outing and business meeting. The latter will be held at 11 o'clock, followed by luncheon at 1 o'clock. The afternoon program will include golf and other sports. Among those who will speak at the business meeting are F. Bendel Tracy, vice-president of the National Paper Trade Association; Arthur H. Chamberlain, secretary, and Chet Spaulding, assistant secretary.

The Annual Spring Outing of the Boston Paper Trade Association is to be held June 10 at the Charles River Country Club, Newton, Mass. Details are to be announced later.

A get-together of the New England Travelers' Club, which includes among its members a number of the paper trade, was held at the University Club Friday evening.

John H. Brewer, vice-president of the Storrs & Bement Company, returned to his office Monday after recovery from an operation for appendicitis.

T. Stewart Foster, president of the Foster Paper Company, Utica, N. Y., called on the trade Thursday and Friday last week.

A. C. Hall, treasurer, and Leon M. Poore, director of sales of John Carter & Co., Inc., have returned from a business trip to mills of The Mead Corporation at Chillicothe, Ohio, and Kingsport, Tenn.

Henry L. Goodman, dealer in fancy papers, accompanied by his associate, Robert A. Ford, called on the trade and some of his mill connections in Worcester, Springfield and Holyoke, Mass., last week.

Mr. Regnier, representative of the Nashua Gummed and Coated Paper Company, has been ill, but is improving at his home at Needham, Mass. Assistant Salesmanager H. C. Brown, of that company, has been calling on the trade in his place.

Marcus Ward, Inc., paper and paper products, has been incorporated with capital of 1,000 common shares having no par value. Edward J. Griffing is president; Joseph A. Galvin, 11 Tudor road, Newton, Mass., treasurer, and Leigh B. Liggett the third incorporator.

Oxholm Joins Pacific Forest Industries, Inc.

WASHINGTON, D. C., May 8, 1935—The resignation of Axel H. Oxholm as Chief of the Forest Products Division of the Department of Commerce, has been announced by Dr. Claudius T. Murchison, Director of the Bureau of Foreign and Domestic Commerce. P. A. Hayward, Mr. Oxholm's Assistant, has been assigned to the position of Acting Chief of the Forest Products Division.

Mr. Oxholm leaves Washington in the near future to take over his new duties as Managing Director of the Pacific Forest Industries, Inc., in Tacoma, Wash., an export corporation made up of the plywood producers in the Pacific Northwest interested in foreign markets.

The necessity for joint action in "developing foreign trade," Dr. Murchison said, has become increasingly apparent and the action taken by the plywood producers in the northwest is an important step in a further strengthening of our foreign trade which is in line with the recommendations of the Department of Commerce.

Sandy Hill Iron Works Reelects Officers

HUDSON FALLS, N. Y., May 6. 1935—At the annual meeting of the Sandy Hill Iron and Brass Works, held May 1, at the office of the corporation, 27 Allen street, Hudson Falls, N. Y., A. J. Kennedy was re-elected president, Dr. Richard C. Tefft, Jr., of Boston, vice-president, and W. J. Elliot Simpson, secretary and treasurer. Harry L. Broughton and Chas. W. Kellogg, together with the above-named officers, were named as directors for the ensuing year.

Quebec's Newsprint Bill Undergoes Change

Elimination of Price Fixing Most Significant Feature—Measure Appears to Concern Itself Almost Entirely With Government and Its Timber Holders—Stumpage Dues May Be Increased If Regulations Enacted Are Not Observed by Tenants

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., May 6, 1935.—The newsprint bill presented to the Quebec Legislature has been redrafted, the most significant feature of the alterations being the elimination of the price-fixing feature, a development which it is felt in interested circles may effectively dispose of the contention of the American Newspaper Publishers' Association that the legislation constituted governmental interference with bona fide contracts between producer and consumer. As the bill now stands, it appears to concern itself entirely with the government and its tenants on the land.

The first change is in the preamble. It read, originally that "it is in the public interest to afford the necessary protection to the development of such forest resources, so as to assure the perpetuity thereof, and to render such development profitable." The reprint bill strikes out "and to render such development profitable."

The title of the bill, "The Forest Resources Protection Act" is not changed, but the next clause, defining whom the act affects is broadened out in scope, and now reads: "Every person or corporation carrying on or causing to be carried on forest operations on land forming part of the public domain for the making of paper or of pulp, or both, or operating a mill for such purpose, which is completely or partially supplied by wood cut on such land or which on or after the 10th of April, 1935, was owned or controlled by the holder of one or more licenses to cut timber on such land, must observe the regulations which may be enacted under section 3, in addition to the obligation of carrying out the provisions of any other acts and regulations."

Section 3 is not changed as to its opening portion, namely, to give general powers to the Lieutenant-Governor-in-Council, to adopt, amend or repeal regulations for the judicious development of the forest resources of the province, the control of timber cutting on land forming part of the public domain, the purchase and sale of such wood and its transformation into paper and pulp, and, without restricting the generality of the foregoing the object of such regulations may be as laid down.

Text of Measure

However, there are some changes in the subsequent paragraphs laying down the specific powers of the Government, the reprinted provisions being at considerably greater length than in the original bill, and read:

1.—To provide for the deposit, with the Minister of Lands and Forests, according to the formalities determined, of copies of contracts, covenants or agreements and of their amendments, relating to the acquisition of wood cut on land forming part of the public domain, to its sale and transformation into paper or pulp;

2.—To limit the cutting of wood to the quantities reasonably required, according to the then existing conditions, and also so as not to affect the future yield from the forest;

3.—To protect the forest or mill workman both as regards health and working conditions;

4.—To ascertain the quantity of wood cut on land forming part of the public domain and not utilized in the course of any year to fulfill the obligations justly contracted by those who ordered the cutting thereof:

5.—To fix the minimum proportion of pulpwood cut on land forming part of the public domain to be used annually in any or all the mills referred to in section 2, and to provide adequate penalties payable to the Crown for infringement of such regulation; such penalties not to exceed an amount equivalent to six dollars per cord of one hundred and twenty-eight cubic feet, outside measurement, in respect of the full quantity of such pulpwood so required to be used:

6.—To provide exceptions to the regulations mentioned in the preceding paragraph to avoid retroactive interference with contracts for pulpwood shown to the satisfaction of the Minister of Lands and Forests to have been previously entered into in good faith or for any other reason deemed adequate by the Lieutenant-Governor-in-Council.

Paragraphs 6 and 7 are additions to the original bill.

The reprinted bill eliminates entirely the provisions for creating a bureau to collaborate with any similar body of another province for the purpose of establishing uniform regulations.

Taxation Clause Unchanged

The taxation clause remains the same, namely, that the stumpage may be increased to $6 per cord of 128 cubic feet if it be shown that "the timber holder has not observed the regulations enacted under this act and the provisions under the other acts and regulations which govern him or whose operations are deemed to be detrimental to the interests of the province in the administration of the public domain."

There, however, is a change in the wording to conform with the change in the preamble, for the original bill provided the $6 per cord rate could apply if it also be established that the holder "has disposed of the said products at a price which does not permit of a reasonable profit on their manufacture." Consequently, the element of purely material profit is not specifically mentioned in the reprinted bill and consequently newsprint price fixing efforts will be still more indirect.

Provision is made whereby the companies or other forestry limit holders will have to give information under oath when required to do so as to their operations.

The Quebec legislation, as now constituted, closely parallels legislation now in effect in Ontario. Hence Premier Taschereau of Quebec and Premier Hepburn, of Ontario, when they meet shortly to discuss the newsprint problem, will be in a better position to reach an effective agreement.

C. G. Clinch Goes With Watab Paper Co.

CARTHAGE, N. Y., May 6, 1935—Charles G. Clinch, who resigned as chief engineer at the National Paper Products Company two years ago, plans to leave within a few days for Sartell, Minn., where he has accepted a similar position with the Watab Paper Company. Since leaving the local concern after 17 years of service he has been connected with a paper mill at Little Falls. He is the inventor of numerous paper mill appliances and president of the firm of Clinch, Rigabar & Eddy, producers of a paper machine synchronizer.

Demand for Paper Less Active in Chicago

Local Paper Market Appears Drifting Towards Seasonal Slackness—Fine Paper Section Continues Rather Listless, With Comparatively Few Mills Reporting Improvement—Kraft Paper Moving Slowly, Following Filling of Seasonal Commitments

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., May 6, 1935—Interest locally—and marketwise—centers on the meetings of the writing, book and sulphite groups to be held in Chicago this week and at which it seems as though something may have to be done to counteract rising costs of production in these lines. The meeting of the kraft group the following week is also causing some interesting comment. Meanwhile, the market in general is said to be drifting toward seasonal slackness. Nothing outstanding or particularly alarming is noted about the decline but a general slowing up in orders, except for a few mills, is in evidence. The book paper market reported a noticeable falling off although a comparatively few book mills report improved conditions. Sulphites are not as active as last week, a situation evidently common with the entire fine line which has, heretofore, rather bucked the trend.

Ground woods are reported dull and the inactivity is said to be fairly general throughout this territory. Krafts are finding the jobber market slowed up following the filling of seasonal commitments. Newsprint conditions are reported as unsatisfactory and contributing to uncertainty. Paper board has seemed to share the relatively small decline —also attributed somewhat to seasonal causes. Blottings are in a similar situation. Waste papers are not finding buyers any too plentiful and the market is reported rather dull in all lines, particularly in the lower grades.

Occupational Tax

The Illinois Legislature has consistently refused to pass the proposed 3 per cent Occupational Tax which would increase the sales tax in Illinois by fifty per cent. Despite threats to close relief stations the legislature has steadfastly refused to add this tax burden on to the consumer public. The bill, both because of its direct effect on retail sales and because many wholesalers and manufacturers come under the provisions of the Act, is being closely watched by the paper industry of the State.

Important Paper Meetings

Manufacturers of book paper and of sulphite bonds will convene in Chicago this week along with the Writing Paper Manufacturers Association for regularly called sessions which bid fair to be in excess of many previous meetings as far as importance is concerned. It is reliably reported in Chicago that the chief topic of discussion at the meetings which extend throughout the week with the Blackstone Hotel as the headquarters will be ways and means of combating the materially increased costs of doing business. A more firm market seems indispensable in view of the increased freight rates, labor and other costs and these groups are about forced to uncover methods of keeping pace with these advances.

The Executive Committee of the Book Paper Manufacturers Association meets today along with the executive authority of the Book division. On May 7 a general meeting of the Association will be held in the morning and continued over into the following day in order that the important subjects may be fully covered. The Writing Paper Manufacturers meet on May 7 with a luncheon-meeting of the Western Sulphite Bond Manufacturers to follow the morning session and a meeting of the sulphite bond group to conclude the day's program.

The following week, on May 14, the kraft executives come to the Blackstone for an executive committee session and a general meeting of the entire Kraft Paper Association for May 15. It is expected that problems similar to those discussed by the fine paper divisions will also characterize these meetings.

Paper Salesmen Meet

The snow flurries during the week of May 1 did not discourage the Midwest Division of the Salesmen's Association of the Paper Industry from continuing its discussion of the initial golf outing to be held on May 24 at the Westmoreland Country Club—the first of five enjoyable outings to be held during the season under the capable direction of Ben Babbitt of the Brown Company. The association held its regular Monday meeting at the Hamilton Club on April 29, having no specific program but utilizing the time not only to discuss the golf prospects but to carefully review trade conditions and to attempt some prophesies over the outcome of the Association meetings scheduled for the week of May 6.

News of the Trade

R. E. Wantz, head of the Rockford Fibre Container Company, was in Washington this week attending the annual sessions of the United States Chamber of Commerce. Mr. Wantz is president of the Illinois Manufacturers Association, which is taking an active part in the interpretation of new deal legislation for state business interests.

Chicago concerns adding new lines during the past ten days or two weeks include the following: James White Paper Company and Bradner Smith & Co., with Marco Cover, manufactured by the Marvellum Company and used in the making of catalogs, covers, folders, etc., Messinger Paper Company, with Coronet Cover, made by the Worthy Paper Company and the Swigart Paper Company and with Replica Bond manufactured by Strathmore. Swigart has also recently given widespread publicity locally to Rhododendron Cover, Strathmore, coming in thirteen colors and in light and heavy weight. The folder describes the sizes and weights and the Antique and Telanian finishes and contains a swatch book of all colors along with full price information.

Roy Fulcher and E. L. Briggs are reported as the incorporators of a new company, the Durable Coated Paper Company, which will be located at 227 West Huron street, Chicago. The new concern, capitalized for 100 shares of no par value stock, will manufacture and distribute a variety of paper products.

The Conway Building at 111 West Washington street, which prides itself on being the "Paper Center of the Middle West," and with a fair claim to the honor as scores of paper concerns headquarter there, is undergoing some improvements in its elevator service which is forcing some of the "high up" paper contingent to use the local elevators for the time being. All banks of elevators in the big building are undergoing a remodelling.

Refining Pulp Screen Tailings

By Anton J. Haug

An unusual amount of interest is being shown these days in two aspects of the refining of screenings and tailings. The first is to recondition tailings, hitherto wasted or usable only in an inferior product, so that this fiber can be mixed with the regular furnish. Another possibility that has been given consideration of late is the idea of purposely grinding for high production and refining the higher percentage of coarse material to a *controllable* fineness. A machine that will accomplish either of these objects is the Haug Refiner.

A brief description of the machine and its principle will explain its construction. A number of rolls run smoothly and steadily against the inside of a cylinder with a pressure dependent on the speed at which they are kept in motion. They roll over the tailings, pressing them against the walls of the cylinder, and a series of flights convey the material through the machine.

A specially designed thickening machine, assures that the consistency of the tailings supply is right for obtaining a certain desired quality of refined stock and that these tailings are fed in a manner to get maximum refiner performance.

The refining unit consists of two machines; the Drainer being usually set directly over the Refiner. This arrangement takes up very little floor space, (See Fig. 1.) One motor drives the complete unit.

The size of unit mostly in demand at present will refine all the screen tailings from about 100 to 150 a.d. tons of ground wood per 24 hours, with a total power consumption of about 35 to 40 hp. for the whole unit, or it will refine all the sulphite tailings from a 75-ton mill well enough so that the refined stock can be used in the regular paper. More detailed figures will be cited below.

By capacity is meant operation on the basis of producing a quality of pulp which can be mixed with the regular furnish. On the basis of a lower quality, the capacity is considerably greater and is proportionate to the grade of pulp made.

Control of Quality

A very valuable and important feature of this refining unit is that the quality of the refined stock may be instantly varied during operation by setting the draining device and refiner speed to obtain the desired fineness. Stock from the Haug Refiner is used in high-grade specialties, in news and other grades of papers and in each case it is possible to make a quality best suited to the prevailing conditions.

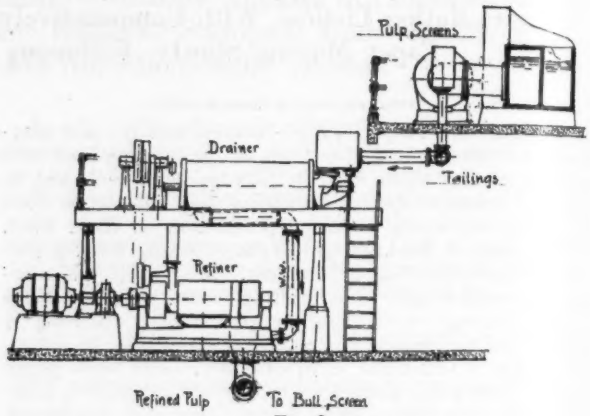


FIG. 2

The simplest method of installation is represented in Fig. 2, which is recommended only where the supply of tailings to the refining unit is fairly uniform in consistency and constant in volume. If there are considerable fluctuations and interruptions in the tailings supply this method of installation cannot be expected to give maximum performance. However, where provisions for uniformity in supply have been made, the results are very satisfactory. Installations of this type are in use in all the mills of the Great Northern Paper Company, also at St. Croix Paper Company, Canadian International Paper Company, etc.

Tailings are generally very irregular in size, ranging from a small fractured fiber particle to a large sliver, stick or knot. To make a uniform pulp from this material pre-

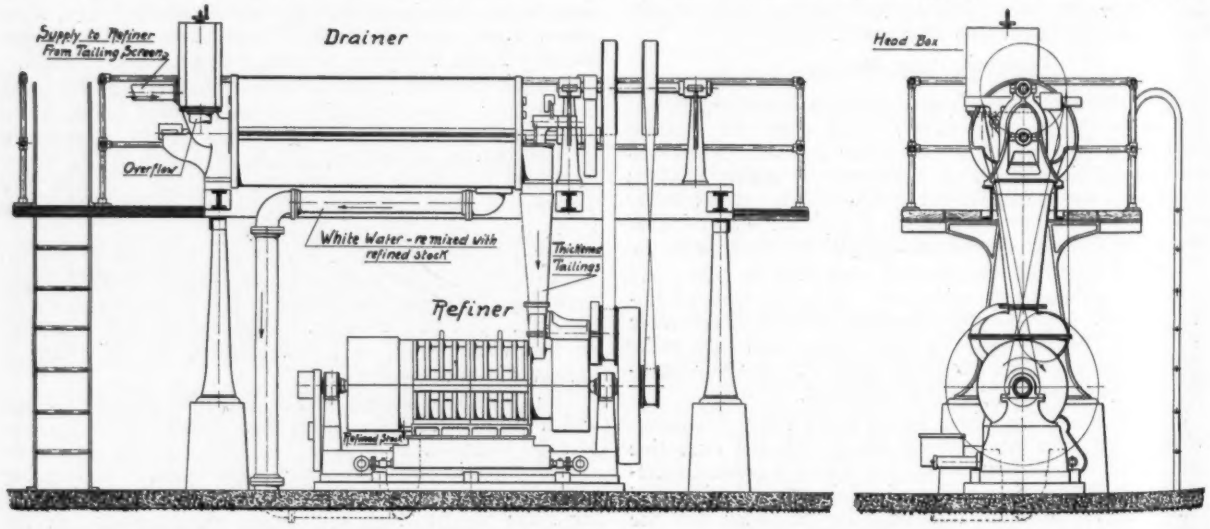


FIG. 1

Diagram of layout of Haug Refiner unit, with drainer shown on balcony over refiner, but parts may be on separate floors and may or may not be disposed vertically.

sents quite a problem and the refiner should, therefore, be given every chance to receive at least a constant supply of it.

Some Typical Installations

A system with an equalizing chest, shown in Fig. 3, is in use at the Maine Seaboard Paper Company and this arrangement has made it possible to run the refiner at a remarkably even load throughout the day with the result that a definite quality of refined stock can be maintained. Originally two refiners were used at this mill without the equalizing chest. Operation was quite satisfactory but when the chest was put into use the improvement in average yield per machine of a good quality pulp was very noticeable. This mill now has three Haug refiners in operation.

Another arrangement was specially developed for the Southern Advance Bag and Paper Company, which was the first mill in the South to use the Haug refiner on kraft tailings. In the refining of tailings which come from flat screens discharged periodically, a special bucket wheel chest is employed, as shown in Fig. 4, which is fed by a conveyor coming from the screens. Screens, chest and refiner are on the same floor but no pump is used. In this system the refiner runs only part of the day, catching up with the tailings supply in 15 to 21 hours. One unit refines all the tailings from a production of 220 tons and produces an excellent pulp of exceptionally great strength with a power consumption of about 5 to 6 hp. per ton.

An almost ideal system for news mills is shown in Fig. 5 and is in use at the Mersey Paper Company, Limited. Here a circulating box designed with a riffling bottom evens out fluctuations in the tailings supply. The refined stock is screened by a separate screen, and the screened refined stock runs directly into the spout leading to the thickeners.

Disintegrating Dirt

The problem in refining tailings is not only of making a fibrous product from the conglomeration of all sizes of slivers, but to also work up the inherent dirt. The Haug refiner can produce a fine fibrous pulp with the dirt disintegrated to a high degree so that it becomes harmless, in the sheet, or it can produce a long, well hydrated or free fiber according to the method of operation.

The argument against refining sulphite tailings for the news sheet will be by some timid soul, that one cannot make a clean pulp from this material as it contains small knots, but they are grinding up three to four times as many knots in the grinders. It will surprise these people that the screened refined stock from the sulphite tailings makes actually a cleaner pulp than they are putting out with their own systems from the sulphite re-screens. When the real source of the dirt is attacked and wood room operations are improved, the refined pulp from the tailings will actually be superior to the primary pulp.

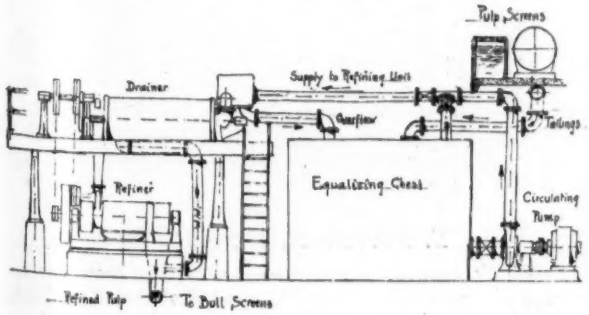


FIG. 3

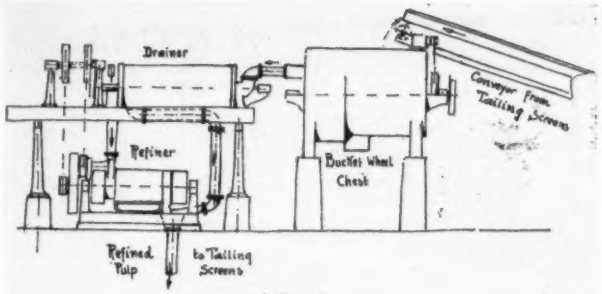


FIG. 4

In the production of news a certain amount of fines in the pulp are necessary to form a good sheet. The Haug refiner is already used by several leading mills to furnish the fines, and in consequence grinder production can be stepped up, resulting in a lower hp./ton for ground wood. So, the tailings are not only saved, but the whole production of ground wood has been made more efficient. The Haug refiner has become a very valuable part of modern ground wood mill practice.

A size 2 unit will refine about 3½ to 4 tons of actual ground wood tailings. The capacity of the unit will be larger if the tailings are rich; i.e., apparently larger. The extra amount of fiber going to the refiner will not make any more work for it, but simply pass through it. Assuming that the amount of screen tailings is about 3%, one unit will refine all the tailings from 100 to 150 a.d. tons of ground wood per 24 hours. The power used for driving the drainer and refiner is from 35 to 40 hp., or about 10 to 12 hp. per ton of refined stock. If it is 5%, it means probably that the tailings are richer and the refiner will be handling 5 to 6 tons, but part of these 5 to 6 tons is good fiber and does not add to the actual amount of refining work to be done by the refiner. Therefore we state the capacity of the refiner as it should be done, as given above.

The good work of the Haug refiner has given rise to the idea that second screens may be eliminated altogether since the quality of the accepted stock from the screens is usually inferior, and by passing it all through the Haug refiner, work up the slivers and dirt, which would not be screened out. In this way, it is possible to improve the cleanliness of the sheet besides saving power consumption

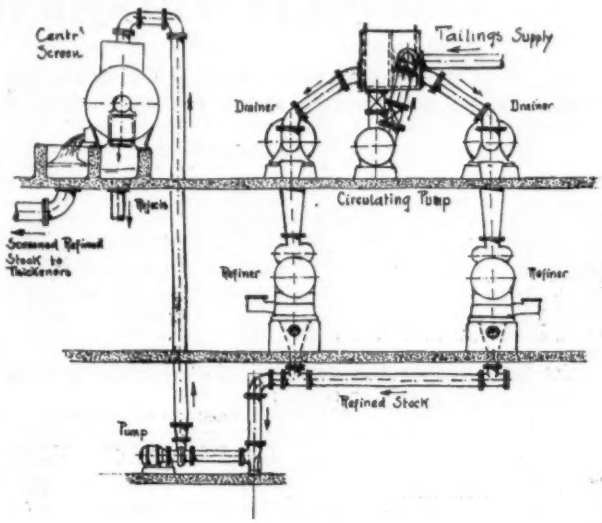


FIG. 5

FIG. 6

FIG. 7

and maintenance of the second screens. The addition of the second screen stock, which is almost good stock but a little on the coarse side, does not materially increase the power consumption of the refiner.

In one prominent mill which has a reputation for an exceptionally high-grade ground wood pulp and a splendid news sheet, and where all ground wood tailings have, for several years, been refined with a Haug Refiner and brought back into their primary pulp, it has been decided that the best way to further improve the quality of the pulp economically was to use still finer perforations in the fine screens and handle the extra amount of tailings with another Haug Refiner. This method makes it possible to reach a very high standard of pulp quality and at the same time retain economy of operation.

In the development of the Haug Refiner, the feature that standardization of machinery and methods means increased value to the user, has been well realized. Not only are the machines themselves thoroughly standardized but also the installations; and operating data from one installation can, with great benefit, be applied to others.

The general neat appearance and practical arrangement of a Refining Unit is well illustrated in Fig. 6 which shows the layout at Finch, Pruyn & Co., Glens Falls, N. Y.

The Grinder Room at Finch, Pruyn & Co. is, without a doubt, the latest word in grinder room practice. Fig. 7 gives an excellent view of this ultra-modern pulp mill, showing, at the left, the new Great Northern Grinders, the greatest development in the art of grinding wood yet devised, and, at the right, the Haug Refining Unit, a fit partner.

Operating on sulphite tailings it was demonstrated recently at the Mersey Paper Company Limited, that one size 2 refiner can handle all the screen tailings from a 75-ton mill, take these tailings from the fine screens directly, without the use of a tailing screen, and refine them well enough so refined pulp could be added to the regular news furnish. The quality of the screened refined stock is very satisfactory and the strength is unusually high. The Mersey Paper Company is, no doubt, the first and only mill in the world which has taken this advanced step in the use of refined tailings, and in improving their sheet by the scientific re-use of all tailings, reducing operating expenses and increasing their yield.

Weekly Production Ratio Report

Reports to the Paper Industry Authority show the following Over-All Production Ratios for the designated periods.

	Reporting Mills		Total Production
	Number	Capacity	Ratio
September, 1934	292–299	.....	59.4%
October, 1934	297–394	.....	64.7%
November, 1934	385–399	.....	61.7%
December, 1934 (a)	396–404	.....	62.1%
January, 1935	397–411	.....	65.8%
February, 1935	407–409	.....	70.0%
March, 1935	406–407	.....	70.5%
*Week ending April 6, 1935	404	166,194	70.8%
*Week ending April 13, 1935	392	164,073	68.9%
*Week ending April 20, 1935	313	124,465	67.2%

Detailed statistics showing the number of mills reporting by ratio groups are given below:

	Number of Mills Reporting		
	Week ending		
Ratio Limits	April 6, 1935	April 13, 1935	April 20, 1935
0% to 50%	114	124	106
51% to 100%	290	268	207

* Subject to revision.

According to reports from the National Paperboard Association, per cents of operation, based on "Inch-Hours" were as follows:

	September, 1934	62 per cent
	October, 1934	63 per cent
	November, 1934	56 per cent
(a)	December, 1934	53 per cent
	January, 1935	61 per cent
	February, 1935	67 per cent
	March 9, 1935	68 per cent
	March 16, 1935	68 per cent
	March 23, 1935	67 per cent
	March 30, 1935	65 per cent
	April 6, 1935	62 per cent
	April 13, 1935	61 per cent
	April 20, 1935	63 per cent

(a) Capacity and percentage data exclude December 25, 1934.

Revised statistics covering delinquent mill returns will be shown in later reports.

L. T. Stevenson Moves Offices

L. T. Stevenson, paper manufacturers' agent, has removed his sales offices to 17 East 42nd street, New York, where he occupies larger and more desirable quarters.

New Automatic Voltage Adjuster

A new automatic generator-voltage adjuster, designated as Type G4, for use with small a-c generators, synchronous motors, synchronous condensers, and d-c generators has been announced by the General Electric Company. The new voltage adjuster has been developed to meet the need for an inexpensive regulating device where voltage-regulating requirements are not too exacting.

The Type G-4 voltage adjuster consists of a voltage-sensitive element of the movable-core solenoid type which directly operates through levers, a wide-range, quick-acting rheostat. The rheostat is connected in the exciter (or d-c generator) shunt field circuit, and any change in voltage is corrected by direct action of the solenoid on this rheostat. The solenoid is used for either alternating or direct current and, in either case, is excited through a fixed resistor from the generator armature potential. An air dash-pot provides antihunting action.

The rheostatic element consists of two vertical stacks of thin rectangular resistance plates separated by thin metal contact plates. Each resistance plate has a silver-button insert passing through one end. The parts are so arranged that when a slight pressure is applied to the top of the outer end of the stacks, the stacks tilt slightly forward, rocking the resistance plates over the metal contact plates and causing the front ends with their silver inserts to come together one at a time. The rocking action between the resistance plates and metal spacers gives a smooth change in resistance between each pair of silver inserts. When all silver inserts are in engagement a low-resistance silver-conductor path is formed through the rheostatic element. If the pressure is released from the front end of the stacks, the rheostatic element tilts back and the circuit through the silver inserts is gradually broken and the contact resistance between plates increased so that the field current must flow through an increasing number of the resistance plates in series. In this manner, the full resistance of the unit is gradually introduced into the circuit. The action is such that there are no noticeable steps as the resistance changes, a smooth transition from maximum to minimum being obtained and permitting accurate adjustment of field current.

The G4 voltage adjuster is normally at rest and operates only when a change in excitation is required. It acts to change excitation in the proper direction when the solenoid element senses a change in generator voltage and moves slightly, one way or the other according as to whether the generator voltage increased or decreased.

Adjustment of the device to maintain a given generator voltage is accomplished by means of a sliding weight on the main operating lever between the solenoid core and the main shaft.

The G4 voltage adjuster is applicable to small constant-speed a-c generators having one, two, or three phases, and with frequencies of 25 to 125 cycles. The a-c generator must have an individual self-excited exciter suitable for shunt-field control, with the range of the exciter voltage not going below 30 per cent of rated value. The device may also be used for voltage control of small constant-speed, self-excited d-c generators capable of shunt-field control.

The Type G4 voltage adjuster is furnished on its own metal base, with a perforated extension over the rheostat element. The fixed resistor for connection in series with the solenoid coil is furnished separately. The voltage adjuster is suitable for panel mounting, for bracket mounting at the end of a switchboard, or it may be mounted in any convenient location which suits the user's requirements.

Northwestern Superintendents to Meet

The Northwestern Division of the American Pulp and Paper Mill Superintendents Association will hold its annual spring meeting at Marinette, Wis., Saturday, May 18. An innovation this year so far as the superintendents' association is concerned is the invitation which has been extended to mill managers to attend the meeting with their superintendents. There have been quite a number of favorable replies to this action and an unusually large gathering is looked for.

The program for the meeting is as follows:

9:00 A.M. Registration
Mill Visits

MORNING SESSION

10:00 A.M. M. J. Ketter, General Chairman
Address of Welcome—Mayor R. P. Murray
Introduction of Managers—A. B. Hansen
General Business
Address—By Paper Mill Executive
Question Box Discussion—John Cornell

12:30 P.M. Noon Luncheon

AFTERNOON

2:00 P.M. Golf Tournament
Yachting
Mill Visits
Ladies Bridge

EVENING

7:00 P.M. Banquet
Address—By Paper Mill Executive
Presentation of Golf and Bridge Prizes

9:00 P.M. Dancing—Music by "Al Sky and his Musical Stars"

Crane & Co. Bid on Distinctive Paper

WASHINGTON, D. C., May 7, 1935—Crane & Co. were the only bidder, when bids were received today for distinctive paper for paper currency for the coming year by the Treasury Department. It is estimated that about 700 pounds of this paper will be needed for the coming year.

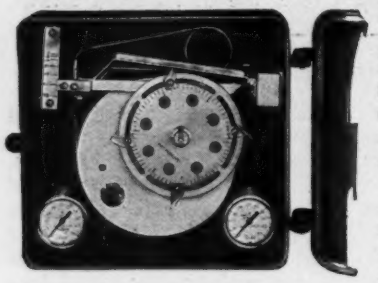
The Crane bid was 37 cents per pound. Under the present contract of which the Collins Manufacturing Company furnished 200 tons with Crane & Co. furnishing the rest the award was made at 37½ cents a pound. Award has not yet been made on the latest Crane bid.

New L. L. Brown Catalog Ready

The L. L. Brown Catalog for 1935 is now being distributed. It contains detailed information about the entire line, including up-to-date lists of all stock items. Copies may be obtained either from the L. L. Brown Paper Company, Adams, Mass., or from distributors of L. L. Brown papers.

A Simplified Time-Cycle Controller

A new control instrument is now available for the automatic, intermittent operation of diaphragm valves or other diaphragm-operated devices. The outstanding features claimed for the instrument by its manufacturer—the Taylor Instrument Companies—are: simplicity, dependability, great adaptability, and a moderate price.



The Taylor Intermitter differs in function from the Taylor Time-Cycle Controller in that it is limited to the repetition of a single operation whereas the latter is capable of performing a number of different operations during the revolution of the cam. Doubtless, production engineers will find its greatest advantage in its adaptability to both a wide variety of time schedules and operating conditions.

The simplicity of design and small number of moving parts is obvious from the accompanying illustration. Trouble-free, long life of the instrument is assured by the manufacturer on the basis of their intimate knowledge of field requirements and their many years' experience in the production of precision instruments.

Instead of employing the conventional fixed cam to time the intermittent operation of a diaphragm valve or other diaphragm-operated devices, the Taylor Intermitter has a circular cam on which the proper number of actuating lugs may be placed; the number of lugs corresponding with the number of operations to be performed during the rotation of the cam. As many of twenty lugs may be used. The duration of each operation is adjustable by moving the bracket carring the nozzle (upper left corner of case) so that its scribe mark is opposite the desired time interval on the scale; the higher the position of the nozzle, the shorter the period of nozzle closure and the duration of the operation. It is by these ingenious arrangements that any change in either the number or durations of the operations, or the interval between operations, is possible without replacing or cutting the actuating cam.

The actuating cam is driven by a powerful and accurate spring-driven clock, available in 1-hour, 6-hour, 12-hour or 24-hour periods of rotation. Electrically driven clocks with identical periods of rotation also can be supplied.

The instrument is available in two types: Reverse-acting; lugs to close nozzle, applying pressure to diaphragm motor. Direct-acting; lugs to open nozzle, relieving pressure from diaphragm motor.

The Taylor Intermitter may be mounted on any diaphragm motor or, if this is not desirable, in any convenient adjacent location. Also, it is possible to operate more than one diaphragm valve or similar device from the same instrument, the number depending upon the operating conditions and the nature of the control required.

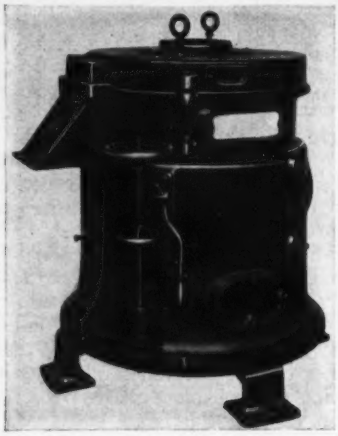
An overpressure release protects the diaphragm motor from excessive pressures in the event of reducing-valve failure. Either compressed air or gas at a constant 25 lb. per sq. in. pressure is specified for efficient instrument performance.

A water-proof, non-corrosive aluminum case with black crackle finish protects the mechanism. Also note that the pressure gauges are located within the case to protect them from breakage and discoloration.

The Taylor Intermitter has already found great popularity in the oil fields where it is used chiefly for controlling the flow cycle of gas-lift wells. It should find similar acceptance throughout Industry on any application which requires the repetition of an operation at given time intervals.

Vertical Grinders

Compact "Vertical Grinders" for large-capacity, low cost shredding of wood fiber for insulating boards, have been developed by Allis-Chalmers Manufacturing Company, Milwaukee, Wis., in sizes using 36-inch diameter attrition discs. The lower disc is driven at comparatively high speed by a built-in electric motor; the upper disc



is stationary with a central feed opening. Grinding clearance between these iron-alloy-faced discs is obtained by handwheel adjustment and then locked. A spring release and manual throw-out lever provide for accidental hard or choke feed. The product is discharged from the side to elevators or other equipment on the same floor as the grinder. An unusual capacity per horsepower is obtainable.

Paper Trade Code Authority

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., May 8, 1935—The NRA has announced the recognition of the following membership of the paper distributing trade code authority: Harold L. Zellerbach, Zellerbach Paper Company, San Francisco, Cal.; Oswald F. Marquardt, Marquardt & Co., New York City; F. Bendel Tracy, Fort Hill Paper Company, Boston, Mass.; Sidney L. Wellhouse, National Paper Company, Atlanta, Ga.; Ralph M. Beckweith, Minneapolis Paper Co., Minneapolis, Minn.; Sidney Strauss, Orchard Paper Company, St. Louis, Mo., and George G. Cobean, J. W. Butler Paper Company, Chicago, all association representatives.

Norway's Newsprint Output Declines

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., May 6, 1935—Norway's output of newsprint paper again declined in 1934, dropping to 140,000 metric tons compared with 150,000 tons in 1933 and 174,000 tons in 1932. The decline in production last year is reported to have been due largely to the unsatisfactory price levels prevailing during the year, and to increased Canadian competition in several important export markets.

DOWNINGTOWN

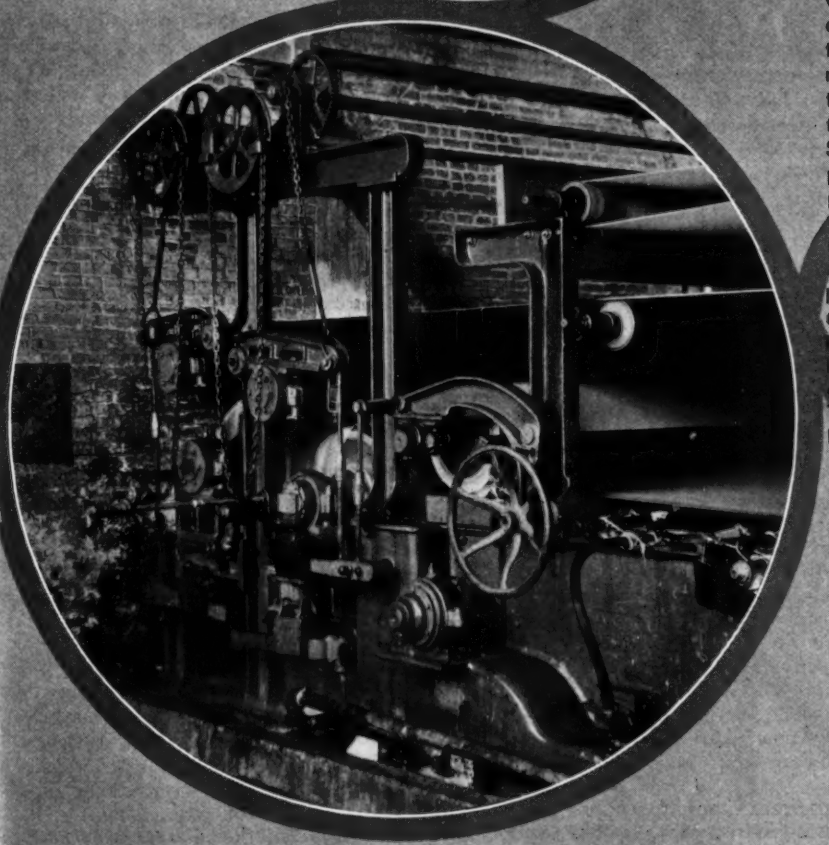
Patented

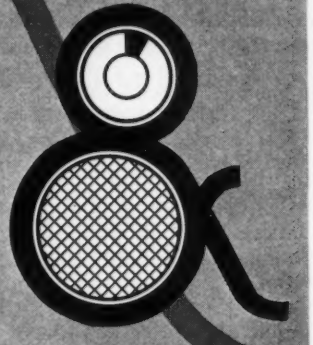
Extractors and Duo-Dehydration are covered by Downingtown Patents Nos. as follows: 1,996,661 — 1,992,713 RE19,521—1,935,837— 1,991,346 — 1,934,543 1,911,310 — 1,998,046.

New Vat Added by Duo-Dehydration

Negligible Increase in Power

Safe, economical water removal provided by Duo-Dehydration permitted the modernization of this machine at minimum cost. The two Extractor Units require no drive, no pump and no motor to drive the pump, all of which would have been needed had a Suction Drum Roll been used; the Suction Felt Roll requires no drive and takes only one-tenth the power absorbed by the drag of flat boxes; the Suction Primary Press that replaced the battery of small primaries uses the same drive and only a 35 H. P. motor on the pump . . . We build Suction Couch Rolls, Suction Press Rolls, Suction Drum Rolls, Felt Cleaning Suction Rolls and Extractor Units . . . Consult us before making Wet End changes on any machine . . . The Downingtown Mfg. Co., Downingtown, Pennsylvania.





No Board Machine is Modern *Without* DUO-DEHYDRATION

CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, Finances and Operation of Paper Mills

Construction News

Erie, Pa.—The Erie Corrugated Paper Box Company, recently organized by local interests, has taken over property at Tenth and Downing streets, and will have plans drawn at once for new plant for manufacture of corrugated boxes and containers. Initial unit will be one-story, equipped for large capacity, and is estimated to cost over $125,000, with machinery. Local Chamber of Commerce, J. K. Shields, secretary, has been active in project.

Seattle, Wash.—The Coos Bay Pulp Corporation, care of H. T. Sprague, 1006 Hoge Building, recently organized by Mr. Sprague and associates, with capital of $500,000, is said to have plans under way for a new sulphite pulp mill on site now being selected in the Coast district. Initial plant is reported to cost over $200,000, with machinery. W. L. Raymond is one of the organizers of new company.

New Haven, Conn.—The New Haven Pulp and Board Company, Mill River street, manufacturer of paper board specialties, chip board, etc., has awarded general contract to the H. Wales Lines Company, Meriden, Conn., for alterations and improvements in mill on East street, recently referred to in these columns. Work will be placed under way at once. No estimate of cost announced. Frederick L. Smith, 21 East Fortieth street, New York, N. Y., is engineer.

Chicago, Ill.—The Apex Paper Box Corporation, 940 Winona street, has been organized with capital of 350 shares of stock, no par value, to operate a local plant for the manufacture of paper boxes and containers, and early establishment. New company is headed by Morris N. and Samuel Jaffe.

Brockton, Mass.—The Wind Innersole and Counter Company, Inc., Rutland square, manufacturer of paperboard specialties for shoe service, has taken out a permit for new two-story and basement addition, for which superstructure will be placed under way at once. It will be 60 x 100 feet, reported to cost over $45,000, with equipment. General building contract has been awarded to T. F. Crowell & Sons, 19 South street, Brockton.

New York, N. Y.—The Delrose Paper Products Company has leased space in six-story building at 465-69 West Broadway, and will occupy for local storage and distribution plant, including company headquarters.

Jersey City, N. J.—Samuel Meyrowitz and Irving Firestone have leased space in local factory at 232-46 Central avenue, and will occupy a new plant for manufacture of paper boxes and containers. It is proposed to install equipment at once.

Troy, Ohio—The Gummed Products Company, manufacturer of gummed paper tape and kindred paper goods, has construction under way on proposed new addition to local mill, recently referred to in these columns, comprising one-story unit, totaling about 50,000 square feet floor space, to be used for increased capacity. It is proposed to have the building ready for equipment installation early in the summer. A new power house is also in course of erection. Entire project will cost more than $200,000, including equipment. General contract is being handled by the Gillmore-Carmichael-Olson Company, Euclid Building, Cleveland, Ohio. John H. Deekin, Times-Star Building, Cincinnati, Ohio, is architect.

Cleveland, Ohio—The Industrial Rayon Corporation, 9801 Walford avenue, manufacturer of viscose rayon products, has awarded general contract to the George A. Rutherford Company, 2725 Prospect avenue, city, for alterations and improvements in mill. Work will be placed under way at once and is estimated to cost about $25,000.

Tonawanda, N. Y.—The Buffalo Wall Paper Manufacturing Company, Inc., has been organized with capital of 100 shares of stock, no par value, to manufacture wall papers and allied products. Now company will take over and succeed to organization of same name, with local plant on Sawyer avenue.

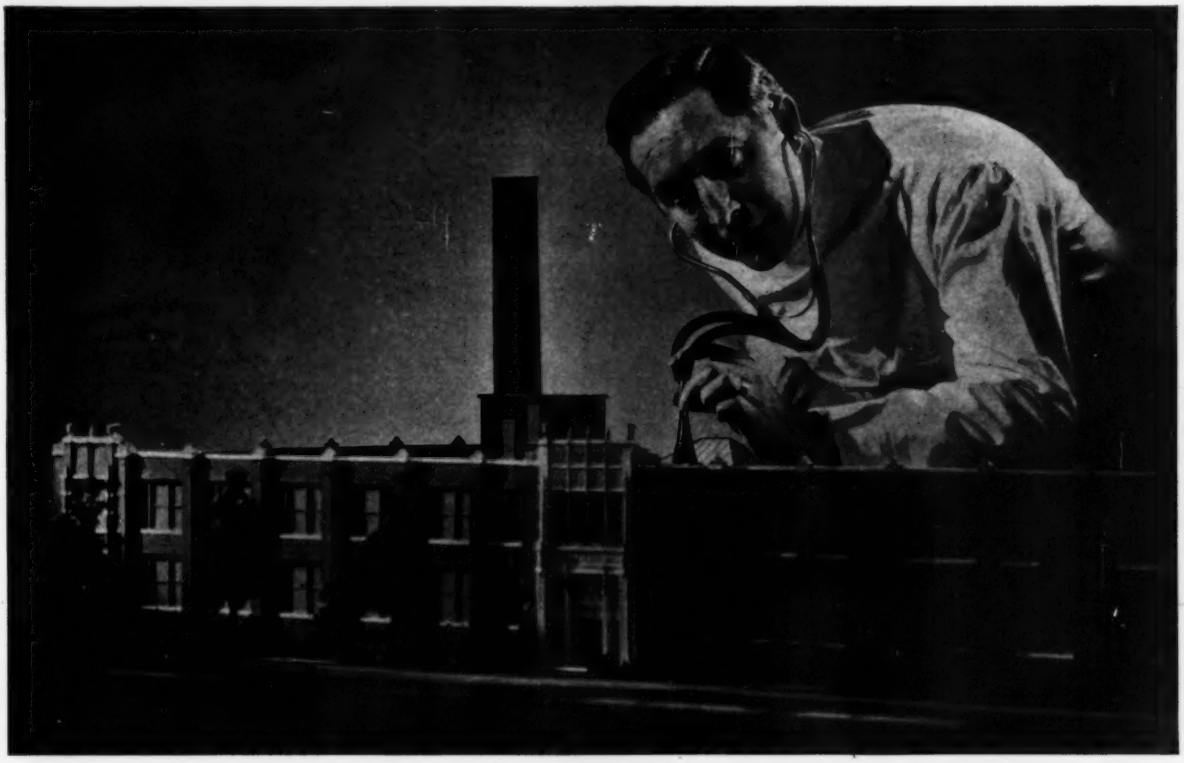
Lawrence, Ind.—Fire recently damaged a portion of local mill of the American Cellulose Company. An official estimate of loss has not been announced. The damage will be replaced.

Oswego, N. Y.—The Oswego Paper Company, Inc., recently organized with capital of 200 shares of stock, no par value, plans operation of local plant for the manufacture of paper dishes and kindred paperboard specialties. New company is headed by Howard E. Reddick, 92 East Bridge street, Oswego; and Andrew J. Moore, 111 Lincoln Park drive, Syracuse, N. Y.

Gatineau, Que.—The International Fibre Board Company, Ltd., is completing plans and will take bids at once on general contract for new one-story addition to mill, to be equipped for considerable increase in present output. It will cost close to $50,000, including equipment.

Trail, B. C.—The Consolidated Mining & Smelting Company of Canada, Ltd., Montreal, Que., has plans under way for the construction of a large plant at Trail for the production of sulphur oxide and allied sulphur products, including elemental sulphur used in the newsprint industry, in which latter field the company plans extensive activity. The new plant will comprise several units and is estimated to cost close to $2,500,000, with machinery. It is expected to begin work this spring.

Lobositz, Czechoslovakia—A controlling interest in Boehmische Glanzstoff Fabrik, Ltd., Lobositz, manufacturer of viscose rayon products, has been acquired by the Association for Chemical and Metallurgical Produc-



YOUR ENGINEER IS THE DOCTOR . . . Accept His Diagnosis

• Your engineer is charged with the well-being of your plant. He knows the danger of that insidious "little ailment," the slight complication that, neglected, may necessitate a major operation.

When he prescribes for an ailment, give careful attention to his recommendations. Worn valves and fittings, faulty steam traps, pipe lines improperly sectionalized, prevent a plant from functioning to fullest efficiency.

Make a complete survey of all factory requirements to assure yourself that maximum productivity is being maintained with minimum operating costs.

A Tacoma institution following the recommendation of its engineer, installed new Crane piping, valves and fittings at a cost of $535.00 including both labor and materials. It reports savings of over $350.00 a year. There are thousands of simila. instances of economic spending.

Call on Crane representatives to help your engineer. They can determine if piping changes are needed and the resultant savings. Our plant check-up list will be sent you without obligation. Write for it today. Remember too, that all Crane products are backed by the Crane insistence on precision and sturdiness. A practice that has persisted for four score years.

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CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO, ILLINOIS · NEW YORK: 23 W. 44TH STREET

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VALVES, FITTINGS, FABRICATED PIPE, PUMPS, HEATING AND PLUMBING MATERIAL

tion, Ltd., Aussig, Czechoslovakia. New owner is planning an expansion and improvement program, with installation of new equipment to increase output from 4000 to 6000 tons per day. Work is reported to cost over $500,000, including machinery.

New Companies, Etc.

New York, N. Y.—The Ajax Tissue Company, Inc., has been incorporated with capital of 100 shares of stock, no par value, to manufacture and deal in tissue paper products. New company is represented by Jacob L. Holtzmann, 40 Wall street, New York.

Brooklyn, N. Y.—Russo Brothers Paper and Rag Stock, Inc., has been incorporated with capital of $20,000, to deal in waste paper stocks. The incorporators are Joseph and Frank Russo, 37 Frost street, Brooklyn.

New York, N. Y.—The Cellafil Products Corporation has been incorporated with capital of 200 shares of stock, no par value, to manufacture and deal in transparent paper stocks. New company is represented by Samuel J. Rawak, 18 East Forty-first street, New York.

Chicago, Ill.—Paper, Inc., 400 West Madison street, has been chartered with capital of 3000 shares of stock, no par value, to deal in paper goods of various kinds. The incorporators include R. W. Kenyon and Henry A. Everett.

New York, N. Y.—The Rich Art Paper Company, Inc., has been organized with capital of 100 shares of stock, no par value, to deal in special paper stocks. New company is represented by Jesse L. Stern, 220 West Forty-second street, New York.

New York, N. Y.—The H. N. Dunning Company, Ltd., has been organized with capital of 200 shares of stock, no par value, to manufacture and deal in pulp and paper-making machinery, parts, etc. Henry N. Dunning, 45 East 55th street, New York, is principal incorporator.

The Oldest Paper Maker

Frank E. Field, of Hinsdale, N. H., writes: "I was reminded recently of some items which I read a year or two ago in the PAPER TRADE JOURNAL regarding the oldest paper makers in the country. One had been making paper for 49 years and another for 52 years. I can beat those records considerably.

"I am now 77 and started working in a paper mill in 1873, which makes me 62 years in the trade. I have seen great changes during this time. Back in 1873 news paper machines were running about 200 feet and now they run 1000 and 1500 feet. During my life I have been superintendent of five mills; the first of these for short periods, then I was with the Fisk Paper Company for 17 years and with the Hinsdale Paper Company ever since they started 25 years ago. At present I am more on the pension list than an active paper maker, although I still go to the mill every day, but am more interested in the hereafter than reading the PAPER TRADE JOURNAL which I have followed for so many years."

Mid-West Fibre Corp. Formed

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., May 6, 1935.—Articles of incorporation have been filed with the Indiana secretary of state by the Mid-West Fibre Corporation, 390 Arlington avenue, North Judson, Ind., formed to manufacture products of fibre board. The corporation has 1,000 shares of no par value capital stock and the incorporators are Michael M. Kirsch, George L. Oliver, G. B. Richie and Leonard Boots, the latter being named resident agent.

John L. Brouwer Joins Gibbs-Brower Co.

John L. Brouwer entered the firm of Gibbs-Brower Company, Inc., paper and pulp mill brokers and dealers in paper and pulp mill machinery and equipment, 401 Broadway, New York, on April 15, 1935. He has been made vice president and a director of the company which

JOHN L. BROUWER

was established in 1898 by Ogden Brouwer and W. W. Gibbs. Ogden Brouwer, Jr. joined the firm in 1911.

Mr. Brouwer graduated from the Monclair High School, Montclair, N. J., in June 1931 and attended the New York University Arts College Business School, University Heights, N. Y. for two years. He was employed in the Orange Agency of the National Biscuit Company from September 28, 1933 to April 12, 1935.

German Paper Industry Reorganized

The reorganization of the German Paper industry along the well known national socialistic lines was consummated during the latter part of 1934 and the first quarter of the current year, according to W. S. Jesien, American Consulate General, Frankfort. On March 14, 1935, the Association of German Wood Pulp Manufacturers convened at Dresden for its last meeting after 62 years of useful existence. After winding up affairs, the Association was incorporated as the "Trade Group Wood Pulp" of the "Industrial Division for Paper, Board, Cellulose, and Wood Pulp." This act completed the reorganization of the German paper industry, which is now entirely subordinated to the ends and policies of the national socialistic state. The new organization, however, will not affect the existence of cartels and price combines, which are to continue outside the scope of the greater national scheme.

Newsprint Production in Sweden

Newsprint production in Sweden during the month of January totalled 22,480 metric tons, an increase of 4,104 tons over the December output, and of 1,810 tons over the corresponding month in 1934, according to a recent report from Acting Commercial Attache Osborn S. Watson, Stockholm. Exports declined slightly, amounting to 15,193 metric tons during January of the current year compared with 15,657 tons during January, 1934.

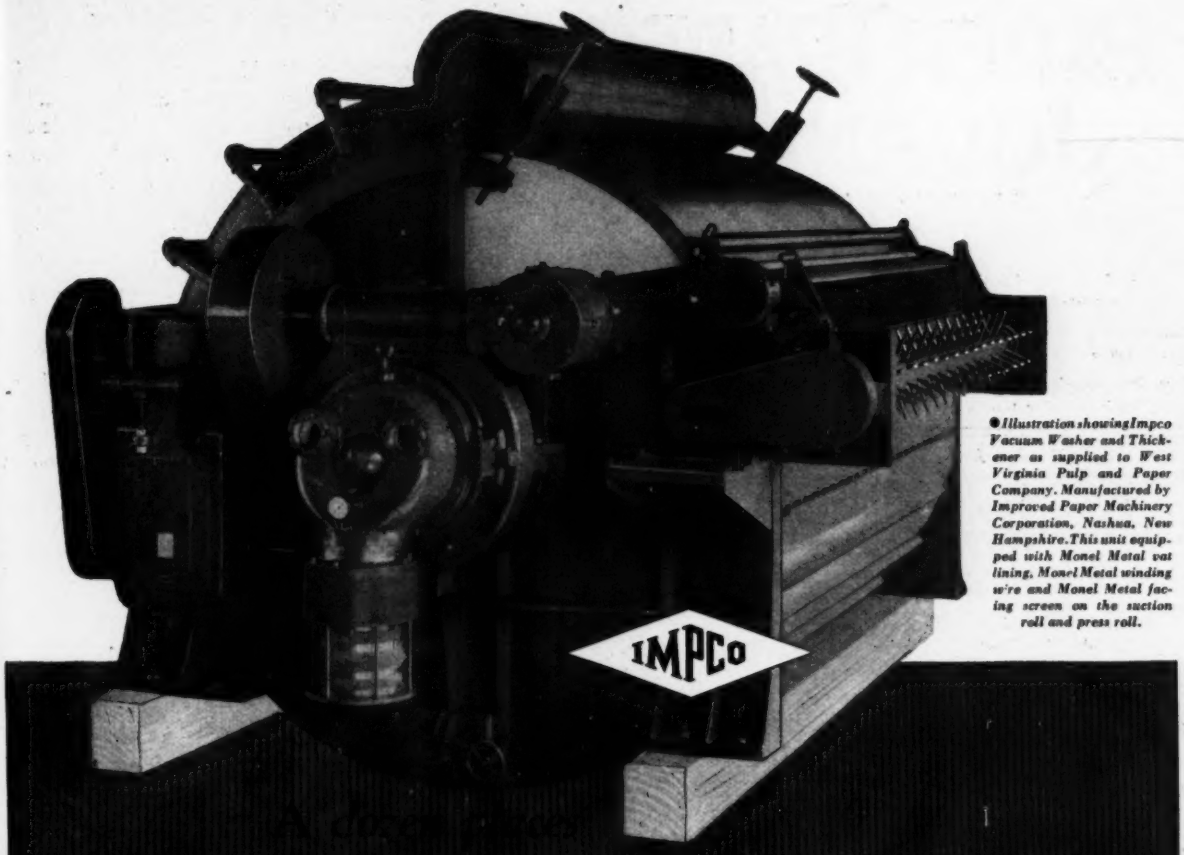

Illustration showing Impco Vacuum Washer and Thickener as supplied to West Virginia Pulp and Paper Company. Manufactured by Improved Paper Machinery Corporation, Nashua, New Hampshire. This unit equipped with Monel Metal vat lining, Monel Metal winding wire and Monel Metal facing screen on the suction roll and press roll.

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Brown Stock Washers	Salt Filters
Washers and Thickeners	Screens

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- Save-All Trays
- Suction Box Trays
- Table Rolls
- Doctor Blades
- Pump Rods and Shafts
- Valves and Fittings
- Alum and Size Tanks

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NEW DEAL MEETS RESISTANCE

The New Deal is meeting with increasing resistance. This fact was clearly demonstrated on several occasions during the past week. In spite of the fact that the President has made it plainly apparent that he wishes the NIRA continued for two years from the date of its expiration on June 16, the Senate Finance Committee, on Wednesday, of last week, overwhelmingly approved a resolution continuing the National Industrial Recovery Act in an amended form from its expiration on June 16 only until April 1, 1936. The resolution would strike out of NRA codes all price-fixing provisions, except those applying to mineral resources, and eliminate from NRA jurisdiction all intrastate commerce.

The resolution as approved by the committee reads in part as follows:

"Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, that Section 2 (C) of Title I of the National Industrial Recovery Act is amended by striking out 'at the expiration of two years after the date of enactment of this act' and inserting in lieu thereof 'on April 1, 1936.'

"Section 2 (A), In the application of Title I of such act after the date of enactment of this joint resolution and until April 1, 1936, the following amendatory provisions shall apply:

"(1) No price-fixing shall be permitted or sanctioned under the provisions of any code; except that provisions for the regulation of prices under governmental control may be included in codes for those mineral natural resource industries in which prices are now fixed pursuant to the provisions of any code and which the President finds to be so affected with a public interest that such regulation is necessary and proper in the public interest.

"(2) No code of fair competition shall be applicable to any person whose business is wholly intra-state.

"Section 3. The President shall review or cause to be reviewed for compliance with the requirements of this joint resolution, every code in effect on the date this joint resolution takes effect.

"In order to afford reasonable opportunity for such review, such codes are hereby continued in effect (subject to cancellation or modification pursuant to the provisions of this joint resolution) for a period of thirty days after June 15, 1935, unless previously reviewed and superseded; but no such code shall continue in effect after the expiration of such thirty-day period unless the President has reviewed such code and has approved it and finds that the code in the form so approved conforms to the requirements of this joint resolution."

On Thursday of last week the Chamber of Commerce of the United States provided another upset when it came out vigorously in opposition to the President's proposals. In nine out of sixteen resolutions the administration was censured for what Mr. Harper Sibley, the new president of the organization called "going too far."

The nine-point opposition to the administration policies as expressed in the resolutions adopted, called for the following:

1. Opposition to enactment at this session of the Omnibus Social Security bill in its three principal sections, old-age assistance unemployment compensation and compulsory old-age insurance.

2. The NRA should be allowed to expire in June and be replaced with a substitute measure on a strictly temporary and limited basis.

3. Rejection of the pending bill to abolish utility holding companies under Federal regulation.

4. Withdrawal of governmental agencies from activities properly the function of trade associations.

5. Unalterable opposition to the Wagner Trade Disputes Bill and the Black-Connery Thirty Hour Week Bill, with a finding that they would disrupt instead of promote proper relations between employer and employe.

6. Indefinite postponement of action on Title II of the omnibus Banking Bill revising the Federal Reserve System to make it function more in the interests of recovery.

7. Rejection of the AAA-sponsored bill to broaden Federal authority to license processors and distributors of farm products and modification of present AAA control policies.

8. Modification of securities legislation to encourage investment in durable goods industries, and retirement of government from all competition with private enterprise.

9. Enactment of legislation making it a criminal offense to advocate violent overthrow of the Federal Government or of any form of law, and denial of use of mails for advocating in writing such a movement.

In spite of the fact that the President waved aside this sharp criticism of his policies, it is apparent that they have made a profound impression on many industrial and business leaders who seem of the impression that the time has arrived when more attention should be paid to means for directly stimulating business recovery rather than to reform measures which may have merit in themselves, but

which may delay starting the wheels of industry at this time.

The fate of the NIRA is not of course by any means settled by the resolution of the Senate Finance Committee continuing it only until April 1 of next year. It is likely that the Senate will conclude its work on the bill in the next few weeks, but that it will be vastly changed after it has been taken up in the House. There is said to be a likelihood that the Supreme Court will hand down its decision in the Schechter case involving the constitutionality of the NIRA before it adjourns early next month, and this decision may naturally influence the action of the House very greatly.

If the President persists in his present policy, which judging from all the present indications seems probable, it does not indicate an early adjournment of Congress and this for the sake of business is greatly to be regretted.

"Cut-Rite" Patents Upheld by Courts

In 1929 the Automatic Paper Machinery Company, Inc. brought suit against Julius Levine & Co. of Passaic, for selling Waxtex waxed paper manufactured by Menasha Products Company of Menasha, Wis., alleging that the Waxtex box infringed U. S. Patent No. 1,630,495, covering their Cut-Rite box. Menasha Products Company intervened and defended the action.

On March 28, 1932, the United States District Court signed a decree holding the patent valid and infringed, and enjoined Menasha Products Company from further infringement. Menasha Products Company thereupon took an appeal to the United States Circuit Court of Appeals for the Third Circuit.

On February 15, 1933, the Circuit Court of Appeals handed down an opinion affirming the findings of the District Court and holding the patent valid and infringed.

Shortly after the suit was first brought, the Menasha Products Company modified their Waxtex box and have continued to market their paper in this box to the present time.

The Automatic Paper Machinery Company, Inc. alleged that the modified Waxtex box still infringed their Cut-Rite patent and the case was again submitted to the courts.

On April 23 of this year the Circuit Court of Appeals handed down an opinion holding that the present modified form of Waxtex box also infringed the Cut-Rite patent.

The R. B. Davis Sales Company of Hoboken, New Jersey, are the sole distributors for Cut-Rite Waxed Paper.

Superintendents Meet at Glens Falls

GLEN FALLS, N. Y., May 4, 1935—About 150 members of the New York-Canadian division of the American Pulp and Paper Mill Superintendents Association attended the meeting held at the Queensbury Hotel here this week. R. W. Hynes, manager of the Newton Falls Paper Company and president of the organization, presided. Business sessions were held on Friday and Saturday and the members also visited the mills of Finch, Pruyn & Co., Imperial Paper and Color Works and the International Paper Company at Fort Edward. Among the principal speakers was L. B. Neilson, staff engineer of the Socony Vacuum Company, who gave an address on "Diesel Engines." A banquet, golfing and other social events were included in the program which was concluded today.

To Receive Bids for Waste Paper

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., May 8, 1935—The Government Printing Office will receive bids on May 27 for the purchase of shavings, waste paper, etc., that may accumulate there during the fiscal year beginning July 1 next. Estimated quantities which will be available include the following:

100,000 pounds of white and colored shavings from blanks, etc.

400,000 pounds of white shavings from book and mimeograph papers.

100,000 pounds of white shavings from book papers mixed with colored.

100,000 pounds of white and colored shavings and clean waste.

200,000 pounds of newsprint and wood manila shavings.

200,000 pounds of postal card bristol trimmings.

70,000 pounds of used white monotype keyboard paper.

200,000 pounds of binders board, strawboard and chipboard clippings.

3,000,000 pounds of paper wrappers from rolls and flat stock.

400,000 pounds of printed paper waste, free from ground wood.

400,000 pounds of discarded publications.

4,000 pounds of wrapping twine and rope from bundles.

15,000 pounds of waste and scrap book cloths.

Bids and Awards for Government Paper

WASHINGTON, D. C., May 8, 1935—The R. P. Andrews Paper Company will furnish 3,750 pounds (30,000 sheets) of 20 x 25, 50 per cent rag gray laid coverpaper at 13.09 cents per pound, bids for which were received on April 24.

Reese & Reese will furnish 1,000 sheets of 30 x 33 red sulphite paper at 5.63 cents per pound, bids for which were received on April 19.

The following bids were received for 29,988 pounds of litho finish map paper; at 11.866 cents per pound: Barton, Duer & Koch Paper Company, Perkins-Goodwin Company and Mathers-Lamm Paper Company. At 13.96 cents per pound: R. P. Andrews Paper Company, American Writing Paper Company, and Whiting Paper Company.

The Printing Office also received the following bids at 6.54 cents per pound for 72,000 pounds of white sulphite ledger paper; Whitaker Paper Company, Old Dominion Paper Company, and American Writing Paper Company.

Board Group Meeting

Chairman S. M. Hesser has announced the following program for the Board Group Meeting at the Superintendents Convention, John Marshall Hotel, Richmond, Va., June 5, 6 and 7.

"Application of Individual Motors to the Wet Sections of Paper Machines" by Mr. R. R. Baker, Westinghouse Electric & Manufacturing Co.

"The Modern Wet End of Board Machines" by Mr. Allen Hyer, of the Black Clawson Company, Hamilton, Ohio.

"Features of the Suction Felt Roll and Adjustable Control Top Press Roll Drive," by Mr. C. L. Ellis, Downingtown Manufacturing Co.

The board makers will have plenty of opportunity to discuss their own problems at this meeting, according to Chairman Hesser.

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Section of the
Technical Association of the Pulp and Paper Industry
Edited by Ronald G. Macdonald, Secretary

Kalamazoo Valley Section of TAPPI Meets

A dinner-meeting was held by the Kalamazoo Valley Section of the Technical Association of the Pulp and Paper Industry on May 2nd, at 6:30 p.m. at the Park American Hotel in Kalamazoo. About 80 were present.

In a short business meeting it was announced by Chairman Annis that there would be no more meetings of the Section until the fall but that plans were already under way to obtain interesting and diversified fall meetings.

Coating Equipment Developments

The first after dinner speaker was Frank Egan of the John Waldron Corporation, New Brunswick, N. J., who discussed "Recent Coating Equipment Developments." He contended that the replacement of obsolete machinery was an economic necessity and outlined some of the recent improvements in the coating equipment field. He discussed machinery for the application and spreading of the coating mixture and drying and takedown improvements. Mr. Egan also touched briefly on the activities of the TAPPI Coating Committee.

Coating Raw Stock

E. G. Milham of the Watervliet Paper Company, who was the next speaker on the program, spoke upon the "Preparation of Coating Raw Stock." He stated that coating was in reality a converting operation and that the quality of the resulting sheet depended first of all on the quality of the raw stock used. In outlining the properties of a good raw stock he mentioned the effects of furnish and quality of pulp, freedom from strain and distortion in the sheet, freeness during the paper making operation, appearance in regard to uniformity, dirt, color and sizing.

During the very lively discussion which followed the presentation of the two papers H. G. Rappolt of the J. O. Ross Engineering Corporation was called upon to describe a controlled drying unit. He described a completely enclosed system with wet and dry bulb thermometer controls in which the temperature and relative humidity are held constant and drying is accomplished by means of a large volume of air at comparatively low velocity and low temperature. It was the consensus of opinion among those present that the problem of uniform drying is of first importance in a coating mill.

Those who attended were as follows: F. W. Egan, John Waldron Corporation, New Brunswick, N. J.; H. M. Annis, Allied Paper Mills, Kalamazoo, Mich.; H. G. Rappolt, J. O. Ross Engineering Corporation, New York; A. B. Milham, Bryant Paper Company, Kalamazoo; E. G. Milham, Watervliet Paper Company, Watervliet, Mich.; M. Redmond, Kalamazoo Paper Company, Kalamazoo; H. C. Bradford, Rex Paper Company, Kalamazoo; H. Newdorf, same company; Joe Widmeyer, Allied Paper Company; M. R. Wilkins, Bryant Paper Company; John Schneider; C. Sherwood, Sutherland Paper Company, Kalamazoo; J. A. Heenan, same company; H. Heath, Rex Paper Company; R. H. Hurst, Kalamazoo Vegetable Parchment Company, Kalamazoo; A. E. Montgomery, J. O. Ross Engineering Corporation, Chicago, Illinois; L. E. Longstreth, Container Corporation of America, Wabash, Indiana; F. S. Crane, Paper Makers Chemical Corporation, Kalamazoo; T. A. Parker; J. A. Wise, Kalamazoo Paper Company; C. L. Bachelder, Paper Makers Chemical Corporation; H. S. Faram and F. J. Schied, of Watervliet Paper Company; F. K. Shankweiler, Paper Makers Chemical Corporation; H. L. Buckner, Buckner Process Company, Worcester, Massachusetts; C. J. Coleman, C. H. Billington, H. H. Lagerpusch of Container Corporation of America; William Frame, Allied Paper Mills; H. F. Heller of Paper Makers Chemical Corporation; J. H. Weber and Ed Osborne of Allied Paper Mills; L. A. Willoughby, Bryant Paper Company; J. E. Dannany, Allied Paper Mills; C. C. Schneider, Hawthorne Paper Company; A. C. Dreshfield, Paper Makers Chemical Corporation; G. T. Ingling, Kalamazoo Paper Company; E. F. Whittington, Kalamazoo, Mich.; H. M. Eastman and P. W. Bartholomew, Paper Makers Chemical Corporation; W. Kottman and J. E. Bauman of Kalamazoo Vegetable Parchment Company; Archie Webb, Bryant Paper Company; P. F. Denner, Kalamazoo Paper Company; E. G. Brooks, Sutherland Paper Company; S. N. Furney, John Waldron Corporation; A. G. Gudner, Elkhart, Indiana; W. F. Hathaway, W. J. White, A. B. Perlick, F. D. Libby, of Kalamazoo Vegetable Parchment Company; R. R. Buss, Walter Higbie, R. F. Irwin of Paper Makers Chemical Corporation; H. E. Stafford, Hawthorne Paper Company, Kalamazoo, Mich.; P. J. Abel, Stickel Steam Specialty Company; L. L. Griffiths, Heller & Merz, New York; A. W. Riedel, Gus Riedel & Son; A. M. Cole, Rex Paper Company; Fred Fisher, Allied Paper Company; A. W. Macvie; W. S. Taylor, American Cyanamid and Chemical Corporation; R. E. Krudener, Kalamazoo Paper Company; D. D. Bachelder, Sutherland Paper Company; F. L. Brown, Michigan Paper Company; J. E. Costello, J. M. Huber Inc.; W. B. Clements, Bryant Paper Company; Paul Fortier, Michigan Paper Company, Robert Crowell, same company; C. B. Smith, Huron Milling Company, Harbor Beach, Mich.; A. E. Hays, Michigan Paper Company; B. A. Yule, F. C. Huyck & Sons; Douglas Robbins, Middletown, Ohio.

TAPPI Fall Meeting Committee Organization

The committees for the Fall Meeting of the Technical Association of the Pulp and Paper Industry to be held in Atlantic City, N. J., September 18-21, 1935 at the Ambassador Hotel, now stands as follows: general chairman, W. R. Maull, Dill & Collins Inc., Philadelphia; vice chairman, H. P. Cannon, Container Corporation of America, Manayunk, Pa.; ADMINISTRATION AND FINANCE—Chairman, B. M. Thomas, Container Corporation of America, Manayunk; vice chairman, H. H. Hanson, W. S. Hamilton & Son, Miquon, Pa.; SUBCOMMITTEE ON FINANCE AND ACCOUNTING—J. C. Harper, West Jersey Paper Manufacturing Company, Camden, N. J.; R. M. Bates, Thomas M. Royal Company, Philadelphia; J. J. Hearn, Philadelphia; SUBCOMMITTEE ON RAILROAD AND TRANSPORTATION—R. B. Thomas, Dill & Collins Inc., Philadelphia; B. T. Finn, Philadelphia; ENTERTAINMENT COMMITTEE—Chairman, W. M. Shoemaker, National Vulcanized Fibre Company, Yorklyn, Del.; PROGRAM COMMITTEE—Chairman, G. E. Landt, Continental-Diamond Fibre Company, Bridgeport, Pennsylvania; R. M. Cobb, Lowe Paper Company, Ridgefield, N. J.; C. E. Peterson, Riegel Paper Corporation, Riegelsville, N. J.; A. M. Lund, Mazer Paper Mills, Lansdowne, Pa.; J. d'A. Clark, Scott Paper Company, Chester, Pa.; H. C. Schwalbe, Dill & Collins Inc., Philadelphia; PUBLICITY COMMITTEE—Chairman, E. J. Albert, Thwing Instrument Company, Philadelphia. This committee is organized in four committees having various functions. Following are the members of these subcommittees on publicity: Jacob Edge, Downingtown Manufacturing Company, Downingtown, Pa.; L. F. Derr, Philadelphia; Russell Morehouse, Philadelphia Quartz Company, Philadelphia; V. Jacobsen, National Aniline and Chemical Company, Philadelphia; J. Roslund, Philadelphia; C. W. Rivise, Philadelphia; F. Streicher, Dill & Collins Inc., Philadelphia; A. M. Cooper, Philadelphia; G. H. Detweiler, Philadelphia; S. M. Hesser, Philadelphia; Paul Koenig, P. H. Glatfelter Company, Spring Grove, Pa.; Charles McDowell, McDowell Paper Mills, Manayunk, Pa.; D. M. Sutherland, Trenton, N. J.

Lake States TAPPI to Meet

The Lake States Section of the Technical Association of the Pulp and Paper Industry will hold their annual Stag Dinner Party on May 14th at the Terrace Gardens Resort, Appleton, Wis.

The election of officers for the Section will take place at this meeting after which the evening will be turned over to the entertainment committee.

A large attendance is expected and an invitation is extended to all those who wish to attend. Reservations can be made by writing A. T. Gardner, Combined Locks Paper Company, Appleton, Wis.

Stebbins Developing New Lining Material

It is understood that the Stebbins Engineering and Manufacturing Company, Watertown, N. Y., has for some time past been developing a waste sulphite liquor recovery process and a new type of lining which is expected to create considerable interest. No details have as yet been divulged.

A. F. Richter, for many years president of the Stebbins firm, has resigned as president of that organization, in order to devote his entire time to research and development of new lining materials and processes, in behalf of the company.

TAPPI Notes

O. P. Gephart, formerly chief chemist, Oxford-Miami Paper Company, West Carrollton, Ohio, is now superintendent of the Miamisburg Paper Company, Miamisburg, Ohio.

W. J. Hendrich, formerly with the Collins Manufacturing Company, North Wilbraham, Mass., is now with the Byron Weston Company, Dalton, Mass.

D. E. Cousins, formerly with the Crown Willamette Paper Company, Camas, Wash., is now with the Champion Fibre Company, Canton, N. C.

M. S. Shenk of the Stein-Hall Manufacturing Company has been transferred from New York to Chicago.

I. R. Valentine, formerly with the Lee Paper Company, Vicksburg, Mich., is now with the Fox River Paper Company, Appleton, Wis.

G. H. McGregor is now technical director of the Pulp Division of the Weyerhaeuser Timber Company, Longview, Wash.

W. J. Dial, formerly of the Racquette River Paper Company, is now superintendent, Central Paper Company, Muskegon, Mich.

G. A. Ritter, formerly with the Island Paper Company, Carthage, N. Y., is now with the Bayless Paper Company, Austin, Pa.

R. L. Davis, formerly with Consolidated Water Power and Paper Company, is now with the Detroit Sulphite Pulp and Paper Company.

The New England Section of TAPPI will meet at Dalton, Mass., May 17 and 18, 1935.

Special Librarians' Convention

The Special Libraries Association will hold its 27th annual convention in Boston, June 11th-14th with headquarters at Hotel Statler. This live and rapidly growing organization has now a membership of over 1600 trained librarians who manage the libraries of industrial concerns, research laboratories, banks, business offices, newspapers, museums, law, medical, scientific, and other societies, as well as the specialized departments in large public, college and university libraries—in fact, any library devoted to one special field. The importance of trained library service to such special groups is now widely recognized and the Special Libraries Association devotes itself actively to the improvement of the methods and quality of such service.

The program of the coming meeting includes visits to the special libraries of Harvard University, Massachusetts Institute of Technology, and other special libraries in the Boston area, besides three general sessions and a large number of group and section meetings. The Science-Technology Group, which, with a membership of over 200, is one of the most active and alert, will hold three meetings.

Tax Exempt Pine Pulp Paper Mills

A press dispatch from Montgomery, Ala., says that "Governor Bibb Graves of Alabama, Tuesday, signed a bill giving the state tax commission power to grant a ten-year tax exemption to pine pulp paper mills which may be established in the state.

"The City of Demopolis has raised a $38,000 fund to purchase a site for a newsprint plant, for which southern publishers have pledged orders of 60,000 tons of newsprint annually. It was thought a new plant will be established there within the next few months."

A Study of Some Factors Influencing the Formation and Dissociation of Sulphur Trioxide in Sulphur Burner Gases for Sulphite Pulping*

By B. L. Browning[1] and Otto Kress[2]

Abstract

The formation of sulphur trioxide in sulphur burner gases, from the standpoint of the operation of the Texas Gulf Sulphur spray burner, has been investigated. The effects of temperature and of gas composition have been studied, together with the catalytic effect of fused silica, iron, chrome steel KA-2, Dialite brick, and various iron compounds.

The effects of temperature and of gas composition on the decomposition of sulphur trioxide in the presence of fused silica and iron have been studied. Theoretical sulphur dioxide-trioxide equilibrium curves have also been calculated over the range of conditions encountered in commercial sulphur burning.

The dewpoints of burner gas mixtures have been determined for various operating conditions as a guide for avoiding corrosion in heat interchanging equipment.

A new spray type sulphur burner developed by the Texas Gulf Sulphur Company and installed and operated under the supervision of the Institute of Paper Chemistry in the Kimberly mill of the Kimberly-Clark Corporation has been recently described (*9*). During the commercial installation and operating study of this burner it became desirable to ascertain what advantages would be obtained by decreased sulphur trioxide formation, both in economy and in decreased corrosion in heat interchanging equipment. In view of the considerable importance of the subject, it was deemed worthwhile to determine carefully the trioxide content of the burner gases and in addition to make a thorough laboratory investigation of sulphur trioxide formation under a wide variety of conditions.

In the burning of sulphur for the production of sulphur dioxide, a certain amount of sulphur trioxide is invariably formed. From the standpoint of economy, it is necessary to keep sulphur trioxide formation at a low value, since under all circumstances the sulphur so combined represents a complete loss. Sulphur trioxide in burner gases is recognized as being injurious when it passes through the cooler or scrubbing system into the finished acid. In the Mitscherlich process a high content of calcium sulphate in the cooking liquor is injurious in that gypsum is deposited on the heating coils, and in the quick cook process calcium sulphate in the cooking liquor may pass into the finished pulp, recognized in the pulp under extreme conditions as the so-called "egg shells" and resulting in the formation of holes or transparent spots when the pulp is converted into paper.

Although there is a large amount of data in the literature regarding the oxidation of sulphur dioxide to sulphur trioxide, these data have been compiled chiefly from the standpoint of sulphuric acid manufacture. There is little information available as to the formation of sulphur trioxide under the conditions obtaining in sulphur burning as carried out in sulphite pulp mills.

In addition, certain information in recognized paper making texts is unjustifiably carried over from non-related data. For example, the statement is made that maximum trioxide formation occurs at 400 to 600 deg. C., while at temperatures below 200 deg. C. and around 900 to 1000 deg. C., practically no trioxide is formed (*12*). It will be shown later that these values are not applicable to sulphur burning under ordinary commercial conditions.

The work carried out, therefore, has been designed to supplement that already available in the literature, and to obtain data which might be useful in sulphur burning. To this end definitely controlled conditions of experiment have been used, in order to simulate as far as possible the operating conditions prevailing in commercial sulphur burning. No attempt has been made to investigate from a fundamental viewpoint either the exact sulphur dioxide-trioxide equilibrium, or the reaction rates involved. The investigation has been intentionally limited to work which it was felt might have immediate practical significance. It has been further limited to a study of sulphur trioxide formation in sulphur burner gases, no attempt being made to determine the trioxide formation in the burning process.

The Formation of Sulphur Trioxide

Sulphur trioxide in sulphur burner gases may come from three sources:

(a) Decomposition of sulphuric acid present in the sulphur.
(b) Formation during the actual burning of sulphur.
(c) Oxidation of the sulphur dioxide in the burner gases.

The first source accounts for a relatively small amount of the trioxide usually found in sulphur burner gases. Although commercial sulphur usually contains sulphuric acid produced by atmospheric oxidation, the amount is small. In a typical analysis, 0.05 per cent sulphuric acid was found in the sulphur. In terms of sulphur converted to the acid, this amounts to only 0.016 per cent.

The amount of trioxide formed during the actual burning of sulphur is difficult to determine accurately. Undoubtedly it depends to a great extent upon the temperature attained, and the proportion of excess air may be expected to have a considerable influence.

Lunge (*10*) found that when sulphur is burned in a glass tube in a slow current of air 2-3 per cent of the sulphur goes to trioxide. Kastle and McHargue (*6*) found

* Presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 18 to 21, 1935.
[1] Research Associate, The Institute of Paper Chemistry, Appleton, Wis.
[2] Member of TAPPI; Technical Director, The Institute of Paper Chemistry, Appleton, Wis.

that 7 per cent of the sulphur appeared as trioxide when burned in dry air, and that this proportion was not altered by the presence of moisture or carbon dioxide. Cornog, Dargan and Bender (*2*) obtained 3.8 per cent. of the sulphur as trioxide when sulphur was burned in air at 460 deg. C. (860 deg. F.)

At the higher combustion temperatures obtaining in the conventional type of sulphur burner and particularly in the spray burner, a very much reduced sulphur trioxide formation would be expected.

A number of determinations under actual burner conditions (especially for pyrites burners) have appeared, but their basic value is questionable. Under such conditions it is extremely difficult to distinguish between the trioxide formed during the actual burning process and that which is formed later in the burner gases by oxidation of the sulphur dioxide.

The third source must account for a considerable portion of the trioxide found in burner gases. In the presence of atmospheric oxygen, sulphur dioxide is oxidized according to the following equation:

$$2\ SO_2 + O_2 = 2\ SO_3$$

The actual amount of sulphur trioxide formed according to this reaction depends upon two factors:

(a) The final equilibrium condition of the reaction.
(b) The rate at which the reaction proceeds toward the final equilibrium condition.

The final equilibrium condition of the reaction depends only upon the temperature and the composition of the gas mixture. At any given temperature, not all of the sulphur dioxide will be oxidized. Instead, the oxidation will take place only until a certain ratio of the trioxide to the dioxide is produced. High temperatures favor a low ratio, low temperatures a high ratio of trioxide to dioxide.

The rate of reaction is of great practical importance since this rate is sufficiently low that equilibrium is not reached under commercial conditions of operation. Like most chemical reactions, this proceeds more rapidly as the temperature is increased. However, the most important means for speeding up the reaction are the use of catalysts. It is important to note that catalysis affects only the rate at which equilibrium is approached in a chemical reaction, and not the ratio of original and final substances which exist after equilibrium is attained.

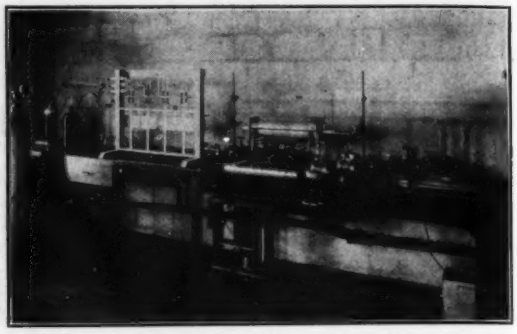

FIG. 2
Photograph of equipment used.

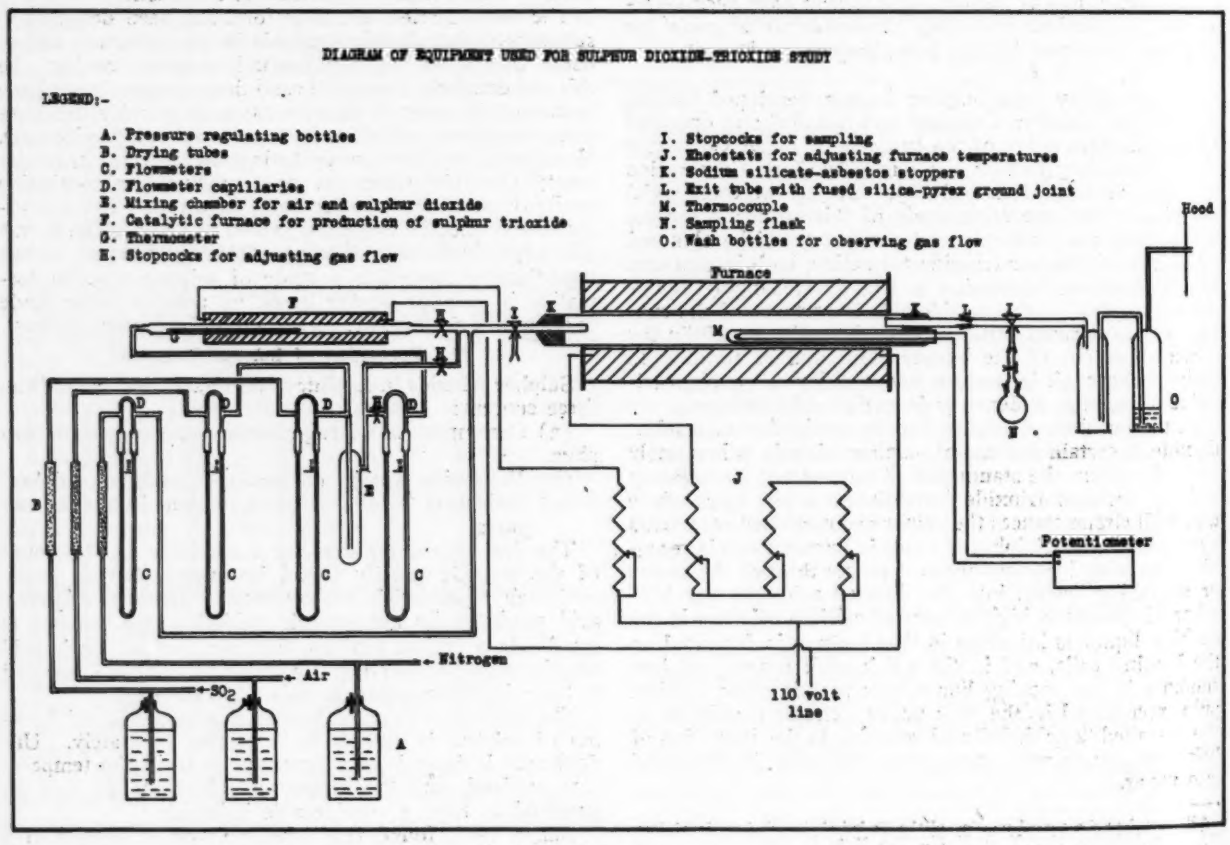

FIG. 1
Diagram of equipment used.

Experimental Set-Up

The experimental apparatus set-up for this investigation is shown diagrammatically in Fig. 1 and in the photograph, Fig. 2.

Artificial burner gas mixtures were made up by proportioning air, nitrogen, and sulphur dioxide through the flowmeters (Fig. 1, "C"). The three bottles with atmospheric relief ("A") provided a constant pressure of each gas, so that the flow through the flowmeters was easily kept at a constant value. The flowmeters were calibrated by means of a wet gas meter, air being used for the calibration of the sulphur dioxide flowmeter. It was possible to keep flowmeter readings constant within a value corresponding to a variation of 0.2 per cent sulphur dioxide in the gas mixture. The flowmeter calibrations were used only to obtain the total gas flow, since the actual gas composition was determined by analysis at the beginning of each run.

The combustion furnace was specially constructed in the Institute of Paper Chemistry shop. It is 18 inches long, and is provided with factory wound chromel heating elements. Three slidewire resistances connected in series with the heating elements provided for accurate adjustment of the furnace temperature.

The temperature of the furnace was measured by a calibrated platinum-platinum 10 per cent rhodium thermocouple inserted into a silica protecting tube extending to the center of the furnace. A Leeds & Northrup student potentiometer was used for measuring the thermocouple potentials. The temperature measurements may be expected to have an accuracy of ± 5 deg. C.

The reaction tubes used in the investigation were of fused silica, iron, and chrome steel (KA-2). Each was two feet long and ¾ inch inside diameter. The gas exit tube was of fused silica, and extended into the furnace to a point even with the end of the furnace. The gas exit tube was provided externally with a ground glass connection, so that the pyrex connecting tube fitted tightly and provided all-glass connections. The glass and silica tubes were sealed into the combustion tubes with sodium silicate-asbestos cement stoppers.

The gas line on each side of the furnace was provided with three-way stopcocks and interchangeable ground glass connections, so that gas samples could be taken both before and after passing through the furnace.

Method of Analysis

DISCUSSION OF METHODS

The analysis of sulphur trioxide in the presence of sulphur dioxide offers many difficulties. The large number of methods which have been proposed may be divided into three groups:

(a) Sulphur dioxide and trioxide are differentiated chemically. This may be accomplished by titration with standard alkali, using two indicators, by titration with iodine for sulphur dioxide and standard alkali for total acid, or by precipitation of the trioxide as an insoluble sulphate.
(b) Sulphur dioxide and trioxide are separated mechanically. The gas mixture is passed over water to convert the trioxide to sulphuric acid mist, which is absorbed by a Hawley filter, a fine alundum thimble, or asbestos packed thimbles.
(c) Sulphur dioxide and trioxide are separated physically. Both are absorbed in water solution, and the sulphur dioxide removed with heat and suction.

The methods given under (a) above are not adapted for routine work and those involving double titrations are not sufficiently accurate where the amount of trioxide is small, as in the work here described. The methods of (b) are satisfactory for small amounts of trioxide, but are time-consuming, and considerable care is necessary to insure complete retention of the trioxide.

In any method which might be used, two important factors are present:

(a) The sulphur trioxide must be completely absorbed and retained. This is a matter of considerable difficulty, since the trioxide is in the form of a vapor or mist which is removed from the gas only with difficulty.
(b) There must be no oxidation of sulphur dioxide during or after the time the sample is taken.

For the above reasons, the method given under (c) in the preceding section was chosen for this work. This method was developed by the E. I. du Pont de Nemours & Company,[8] and has been found satisfactory. Complete absorption of the trioxide is obtained with certainty, and it has been shown that no oxidation of the dioxide occurs. In addition, the method is rapid, is very easily carried out, and is well adapted for the determination of small amounts of sulphur trioxide.

The du Pont Method for the Analysis of Sulphur Trioxide:

The gas sample is taken in a 500-cc. flask fitted with a ground glass stopper and stopcock (Guillard flask). Before sampling, 10 cc. of a .00005 molar solution of brucine hydrochloride are added to the flask. The brucine hydrochloride acts as an inhibitor (*13*) and prevents oxidation of sulphur dioxide. The flask is evacuated by water pump to the vapor pressure of the liquid, and weighed. It is then attached to the sampling line and the sample taken by opening the stopcock. After sampling, the flask is again weighed to obtain the weight of the sample and allowed to stand for one to two hours or until the sulphur trioxide is all absorbed. The flask is then heated in a water bath and suction applied, removing all the sulphur dioxide and nearly all the water. The sulphuric acid remaining is titrated with .025 Normal sodium hydroxide solution.

There are two possible sources of error in this method of analysis:

(a) Loss of sulphuric acid formed from the sulphur trioxide during the removal of the dioxide by evaporation.
(b) Oxidation of sulphur dioxide.

These two points were checked in the following manner: 5 cc. portions of standard sulphuric acid solution were titrated with standard sodium hydroxide solution. Similar portions were evaporated almost to dryness exactly as was done in the method of analysis, and the acid again titrated.

The following titrations were obtained:

5 cc. sulphuric acid solution required 4.74 cc. sodium hydroxide for titration.
5 cc. sulphuric acid solution evaporated almost to dryness required 4.75 cc. sodium hydroxide for titration.

It is evident that there is no loss of sulphuric acid under the conditions of analysis.

To determine whether oxidation of sulphur dioxide occurred, 5-cc. portions of the sulphuric acid were added to Guillard flasks, then 5 cc. of the brucine hydrochloride solution, and a sample of gas containing 16 per cent sulphur dioxide taken before it entered the combustion furnace. The analysis was then carried out as given in the standard method.

The following results were obtained:

5 cc. sulphuric acid solution required 4.74 cc. sodium hydroxide for titration as given above.
5 cc. sulphuric acid solution to which a representative sulphur dioxide sample had been added required 4.72 cc. sodium hydroxide for titration.

Thus, there is no error due to oxidation of sulphur dioxide under the conditions of analysis.

[8] Made available through the courtesy of E. I du Pont de Nemours & Company and published by their permission.

The Guillard flasks used were fitted with interchangeable ground glass stoppers. To each was sealed one unit of a pyrex interchangeable ground glass connection, the other unit being placed in the gas line so that samples could be obtaned either before or after the gases passed through the combustion furnace.

The flasks were weighed on a Becker balance having a capacity of two kilograms and a sensitivity of one milligram. The samples obtained were usually 0.700 to 0.750 gram, depending upon the per cent of sulphur dioxide in the gas and the degree of evacuation of the flask. All samples were run at least in duplicate.

The gas mixtures were analyzed before passing into the furnace by means of an Orsat apparatus, using a 50 per cent aqueous chromic acid solution for absorption of sulphur dioxide and a pyrogallol solution for absorption of oxygen.

Determination of Sulphur Trioxide Formation

EXPERIMENTAL CONDITIONS:

The following conditions have been investigated:

1. Fused silica tube—10.5, 14.0, 16.5, and 19.5 per cent sulphur dioxide.
2. Iron tube—10.5, 14.0, 16.5, and 19.5 per cent sulphur dioxide.
3. Chrome (KA-2) tube—15.0 per cent sulphur dioxide.
4. Silica tube packed with Dialite brick—15.0 and 19.5 per cent sulphur dioxide.
5. Silica tube containing various iron compounds—10.5, 14.0, 15.0, 16.5, and 19.5 per cent sulphur dioxide.

The gas composition in each case approximated the composition of sulphur burner gases. The composition of air is approximately 21 per cent oxygen and 79 per cent nitrogen. When sulphur burns in air, each volume of oxygen used up is replaced by one volume of sulphur dioxide, so that the total sulphur dioxide and oxygen contents of burner gas should add up to 21 per cent. The gas compositions used were therefore as follows:

(1) 10.5 per cent sulphur dioxide, 10.5 per cent oxygen, 79 per cent nitrogen.
(2) 14.0 per cent sulphur dioxide, 7.0 per cent oxygen, 79 per cent nitrogen.
(3) 15.0 per cent sulphur dioxide, 6.0 per cent oxygen, 79 per cent nitrogen.
(4) 16.5 per cent sulphur dioxide, 4.5 per cent oxygen, 79 per cent nitrogen.
(5) 19.5 per cent sulphur dioxide, 1.5 per cent oxygen, 79 per cent nitrogen.

In calculating these gas compositions the following secondary effects have been purposely omitted:

(a) Moisture and carbon dioxide in the air.
(b) Sulphur trioxide which is always formed in the burning of sulphur.
(c) The change in composition due to the deviation of sulphur dioxide from the perfect gas laws.

The gases used for making these mixtures were proportioned by means of the flowmeters already described. Although the flowmeters were previously calibrated, this calibration was used only to obtain total gas flow. The composition of the gas mixture at the entrance to the furnace was always checked by Orsat analysis, and the flowmeter readings then kept constant to insure the same gas composition for the duration of the experiment.

The total flow was adjusted so that the rate of passage of gas through the furnace would correspond approximately to the rate of flow through the spray type sulphur burner. The spray burner has a free volume of 400 cubic feet. On the assumptions that 1000 pounds of sulphur per hour are burned and that the resulting burner gas has a composition of 19.5 per cent sulphur dioxide, the time of the gas in the furnace is found to average approximately one-half minute. To provide the same time in the laboratory furnace, a flow of 250 cc. per minute was used.

EXPRESSION OF RESULTS:

The amount of sulphur trioxide having been determined in each sample by titration, the weight of sulphur dioxide oxidized was calculated. The weight of sulphur dioxide which was originally present in the gas sample is known from the analysis of the gas mixture and the weight of the sample. All values given are per cent conversion of sulphur dioxide to sulphur trioxide, that is, the per cent of the total sulphur which appears as trioxide. The per cent conversion is calculated thus:

$$\frac{\text{Weight of sulphur dioxide oxidized} \times 100}{\text{Weight of sulphur dicxide originally present in sample}} = \% \text{ conversion}$$

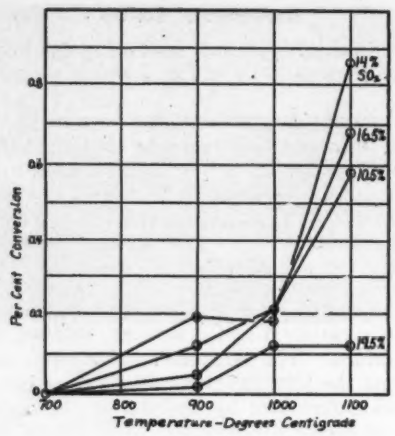

FIG. 3
Per cent conversion in fused silica tube.

The formation of a fog or mist of sulphuric acid when a gas containing sulphur trioxide is passed through water is a very sensitive test. In the runs made, if no mist was obtained in the wash bottles (Fig. 1, "O") the per cent conversion was reported as "none." If a slight mist was present but in such a small amount that no sodium hydroxide was required for titration, "traces" were reported. A conversion of even 0.1 per cent gives a fairly dense mist.

1. Experiments in Fused Silica Tube:

The results obtained with the fused silica tube are given in Table I and Fig. 3. Silica does not act as a catalyst below 900 deg. C. Above this temperature increasing amounts of sulphur trioxide are formed, probably due to increased reaction rate as the temperature is increased. Temperature above 1100 deg. C. could not be investigated with the type of furnace used. In addition, at temperatures above 1100 deg. C. fused silica rapidly devitrifies and becomes useless.

TABLE I
PER CENT CONVERSION IN FUSED SILICA TUBE

Temperatures, Degrees		Per Cent Sulphur Dioxide			
Centigrade	Fahrenheit	10.5	14.0	16.5	19.5
300	572	None	None	None	None
500	932	Traces	Traces	Traces	Traces
700	1292	Traces	Traces	Traces	Traces
900	1652	0.12	0.19	0.05	0.02
1000	1832	0.21	0.18	0.21	0.12
1100	2012	0.58	0.86	0.68	0.12

2. Experiments in Iron Tube:

For this run a commercial grade of steel pipe was chosen. The galvanizing zinc was removed with hydrochloric acid and the tube washed and dried. It was heated in the furnace at 800 deg. C. for one hour with air passing through in order to obtain an oxide coating on the interior of the tube.

In a preliminary run using this tube, very little sulphur trioxide was formed. It will be shown later that iron oxide is not an effective catalyst for the oxidation of sulphur dioxide. However, when the sulphur dioxide gas mixture was passed through the tube for two hours at 750 deg. C., the amount of trioxide formed increased rapidly and finally reached a constant value. It was found that if the temperature were then increased to 850 deg. C. or decreased to 650 deg. C., a less amount of trioxide was formed.

The work was therefore continued by operating at 750 deg. C. until a constant amount of sulphur trioxide was formed. Samples were then taken at this temperature for the four different gas compositions used. The temperature was then successively lowered to 650, 500, 350, and 200 deg. C., and samples taken at each temperature for the four gas compositions. In each case, sufficient time at each temperature was allowed for the formation of trioxide to become uniform.

The temperature was then raised successively to 850 and 1000 deg. C. and samples taken as before. This mode of procedure was adopted so that the maximum catalytic activity of the tube would be obtained at each temperature. The results are given in Table II and Fig. 4. After the runs were concluded, the iron tube was cut into sections for observation of the interior surface. This was very badly corroded, with numerous blisters and pits. Treatment with hydrochloric acid showed a trace of sulphide. No red ferric oxide was present.

TABLE II

PER CENT CONVERSION IN IRON TUBE

Temperatures, Degrees		Per Cent Sulphur Dioxide			
Centigrade	Fahrenheit	10.5	14.0	16.5	19.5
200	392	None	None	None	None
350	662	Traces	Traces	Traces	Traces
500	932	0.50	0.40	0.22	0.16
650	1202	5.06	3.26	3.20	0.76
750	1382	13.27	10.54	5.64	2.93
850	1562	6.77	2.20	1.19	0.06
1000	1832	Traces	0.02	Traces	0.01

3. *Experiments in Chrome (KA-2) Tube:*

This run was divided into two parts, the first with increasing temperature, the second with decreasing temperature. A comparison of the results shows that the formation of a material having catalytic action takes place rapidly only above 850 deg. C. This substance is probably different from that formed in the iron tube, since the maximum activity is noted at 850 deg. C. instead of 750 deg. C. In addition, the maximum production of trioxide is less than that obtained with the iron tube. More trioxide is formed at 1000 deg. C. than is the case with the iron tube, because of the reaction of the iron with sulphur oxides to be described later.

The results are given in Table III and Fig. 5.

TABLE III

PER CENT CONVERSION IN CHROME (KA-2) TUBE

Temperature, Degrees		15 Per Cent Sulphur Dioxide	
Centigrade	Fahrenheit	Increasing Temperature	Decreasing Temperature
350	662	None	Traces
500	932	Traces	0.05
650	1202	Traces	0.28
750	1382	0.03	1.94
850	1562	5.00	4.18
925	1697	3.77	...
1000	1832	1.58	1.58

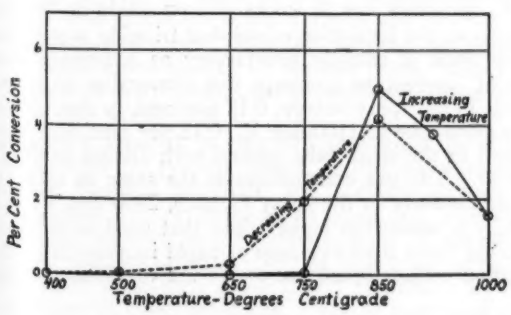

FIG. 5

Per cent conversion in chrome (KA-2) tube. 15 per cent SO_2.

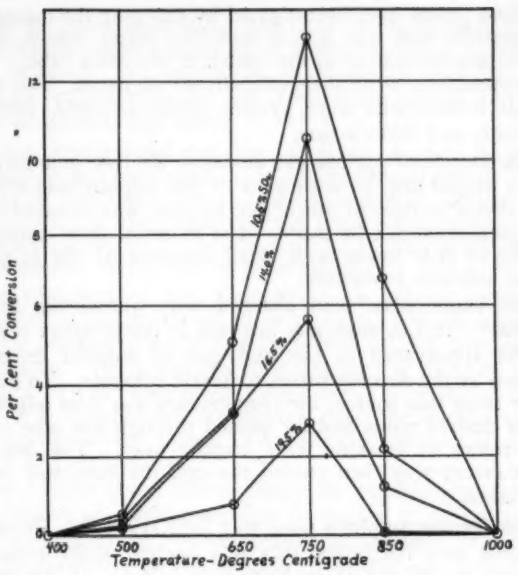

FIG. 4

Per cent conversion in iron tube.

4. *Fused Silica Tube Packed with Dialite Brick:*

Since the spray type sulphur burner is lined with Dialite brick, it is of interest to determine whether this material exerts any catalytic action in the oxidation of sulphur dioxide.

As the results in Table IV and Fig. 6 indicate, there is no increase in the formation of trioxide at high temperatures. At 700 to 800 deg. C. there is a slight increase with the 15.0 per cent gas, probably due to the catalytic action of traces of iron oxide in the brick.

TABLE IV.

PER CENT CONVERSION IN FUSED SILICA TUBE PACKED WITH DIALITE BRICK

Temperature, Degrees		Per Cent Sulphur Dioxide	
Centigrade	Fahrenheit	15.0	19.5
200	392	Slight Traces	...
300-600	572-1112	Traces	...
700	1292	0.13	Traces
800	1472	0.10	...
900	1652	0.06	0.02
1000	1832	0.18	0.03
1100	2012	0.38	0.11

5. *Silica Tube Containing Various Iron Compounds:*

In investigating the catalytic activity of iron in the formation of sulphur trioxide, it is of interest to determine what iron compounds are responsible for the observed catalytic effect. In addition, the possible catalytic effect of the iron oxide ash or clinker obtained in the burning of pyrites is of considerable significance.

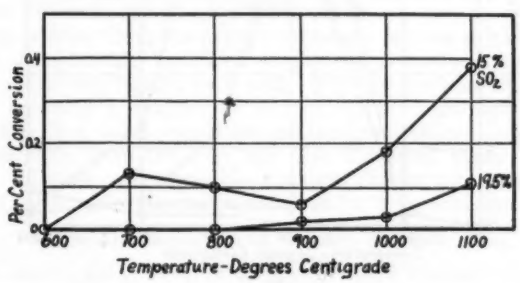

FIG. 6

Per cent conversion in fused silica tube packed with dialite brick.

These points were investigated by charging the materials in question into two 3-inch porcelain boats, which were placed approximately in the center of the silica tube. The determinations were then carried out as usual. The materials investigated were pyrites, ferric sulphate, ferrous sulphate, and ferric oxide.

The sample of pyrites was heated in the tube in a current of air at 800 deg. C. until most of the sulphur was driven off. Prior to this, so much free sulphur was released that analyses could not be made. The material then consisted chiefly of iron oxide with small amounts of the original ferric sulphide remaining.

The boats were then charged with anhydrous ferric sulphate. In this case, any increase in temperature results in the appearance in the exit gas of sulphur trioxide formed by the decomposition of ferric sulphate. To avoid error from this source, the temperature was first adjusted at the desired value and air passed through the tube until only traces of trioxide were coming over. The desired gas mixture was then passed through the tube and samples taken.

The ferrous sulphate used was $FeSO_4.7H_2O$. Prior to charging into the boats, this was heated under reduced pressure at 140 deg. C. to form $FeSO_4.H_2O$. If this were not done, excessive amounts of sulphuric acid would be liberated. The runs on this material were made with the same precautions noted in the preceding paragraph.

The ferric oxide was pure red ferric oxide powder. The effect of this material was investigated with gases containing 10.5, 14.0, 16.5 and 19.5 per cent SO_2.

TABLE V

PER CENT CONVERSION IN FUSED SILICA TUBE CONTAINING IRON COMPOUNDS

Temperature, Degrees		15 Per Cent Sulphur Dioxide		
Centigrade	Fahrenheit	Iron Oxide from Pyrites	Ferric Sulphate	Ferrous Sulphate
300	572	..	Traces	None
400	752	...	Traces	Traces
500	932	None	0.28	Traces
650	1202	Traces	8.11	12.46
750	1382	0.30	2.39	9.54
850	1562	0.29	0.70	2.53
1000	1832	0.95	0.33	0.39

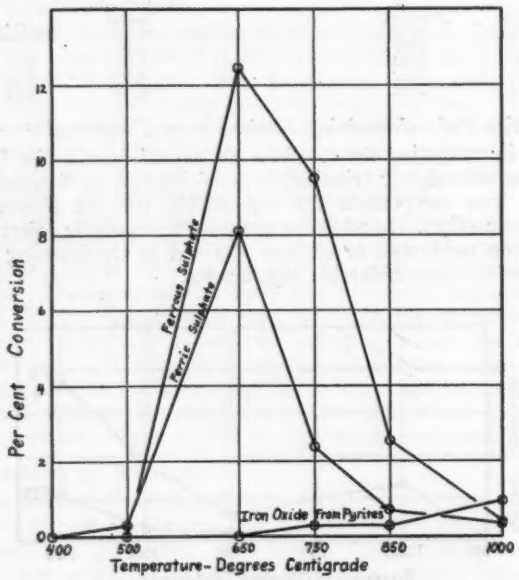

FIG. 7

Per cent conversion in fused silica tube containing iron compounds. 15 per cent SO_2.

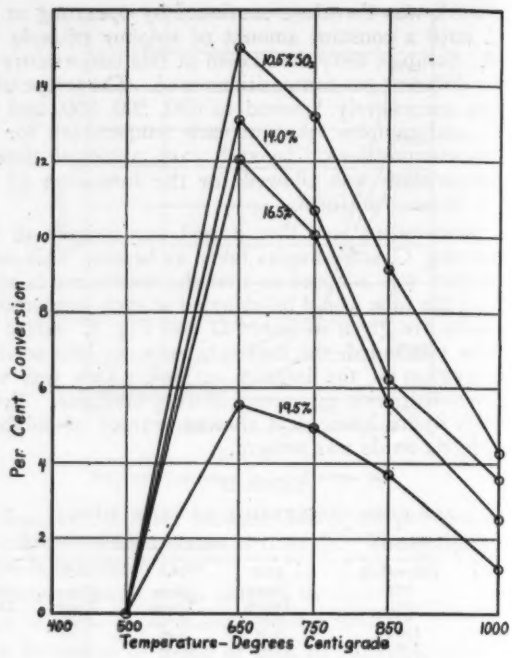

FIG. 8

Per cent conversion in silica tube containing ferric oxide.

TABLE VI

PER CENT CONVERSION IN SILICA TUBE CONTAINING FERRIC OXIDE

Temperatures, Degrees		Per Cent Sulphur Dioxide			
Centigrade	Fahrenheit	10.5	14.0	16.5	19.5
400	752	None	None	None	None
500	932	Traces	Traces	Traces	Traces
650	1202	15.00	13.10	12.05	5.54
750	1382	13.20	10.70	10.06	4.92
850	1562	9.12	6.22	5.60	3.70
1000	1832	4.27	3.58	2.50	1.20

The results obtained with pyrites, and ferric and ferrous sulphates are given in Table V and Fig. 7. Those obtained with pure ferric oxide are given in Table VI and Fig. 8. The determinations given in Table VI were with increasing temperatures; that is, the sulphur trioxide formation was observed at 500 deg. C. for each of the gas compositions used, then at 650 deg. C. and so on.

Discussion of Significance of Results

In general, it may be concluded that vitreous fused silica exerts no catalytic effect on the oxidation of sulphur dioxide. The small formation of trioxide observed at higher temperatures is probably due to temperature effect alone. The Dialite brick also has negligible catalytic effect, except that a slight oxidation occurs at 700 to 800 deg. C., probably due to traces of iron oxide in the brick.

So far as the formation of sulphur trioxide is concerned, Dialite brick is entirely satisfactory as a furnace lining. It is of interest to compare the conversion to sulphur trioxide in the spray burner, 0.17 per cent, to that obtained in the silica tube at 1100 deg. C., 0.12 per cent, and to that obtained in the silica tube packed with Dialite brick, 0.11 per cent. The gas composition is the same in each case. The temperature in the spray furnace, 2400 deg. F. (1316 deg. C.) is somewhat higher than that used in the laboratory, but there is no evidence of rapid increase in trioxide formation with temperature under the conditions in question.

The formation of large amounts of sulphur trioxide in the iron tube appears to be due to the formation of iron

sulphate. From one to two hours were required to develop a considerable catalytic effect which suggests that iron or iron oxides must be changed to some other material before any considerable trioxide formation can take place.

The action of iron in forming surface conditions favoring high sulphur trioxide formation readily explains the relatively high sulphur trioxide content of burner gases from the conventional type of sulphur burner. From a number of available analyses, a conversion to trioxide of one to two per cent may be expected. This, of course, is much lower than the conversions obtained in laboratory experiments. The high conversions in the latter case are no doubt due to the relatively large iron surface exposed to the gas. In the conventional type of rotary burner, the interior is normally covered with a layer of molten sulphur. However, when starting a burner, much more iron is exposed and under certain conditions much larger amounts of trioxide may be formed. This is a possible explanation of occasional troubles experienced due to excessive amounts of calcium sulphate in the cooking liquor.

The results given in Table V show that both ferric and ferrous sulphates are active catalysts for formation of sulphur trioxide. Due to decomposition of the sulphates in the range of temperatures at which catalysis takes place, the valency condition of the iron is necessarily indeterminate and possibly a mixture of sulphates and oxides is present. The clinker of iron oxide from pyrites as used has little catalytic effect.

In Table VI it is clearly shown that iron oxide is an efficient catalyst under the conditions of experiment used. However, iron oxide as such is probably not the material which is catalytically effective. As previously noted in the case of the iron tube, at the beginning of the run but little sulphur trioxide is formed. It is necessary to pass the gas mixture through the combustion tube for a period of from one to two hours before the trioxide formation becomes large and approximately constant in amount. This behavior suggests that iron sulphates are responsible for the observed catalytic effect and that some time is required to form the sulphates so that the maximum catalytic effect is observed. It is difficult to reconcile this behavior with the conclusion of Keppeler and d'Ans (*7*) from measurement of the sulphate trioxide partial pressure above ferric sulphate that ferric sulphate is not responsible for the catalytic activity of iron.

The remarkable catalytic effect of ferric sulphate under different conditions has been clearly demonstrated by Johnstone (*4*). When a gas containing 0.3 per cent sulphur dioxide was bubbled through ferric sulphate solution, 95 per cent of the sulphur dioxide was retained and that portion was completely oxidized to sulphuric acid.

It will be noticed that in this series of determinations, the maximum trioxide production is found at 650 deg. C. This temperature is the same as that at which maximum production was obtained when ferrous and ferric sulphates as such were used. This fact suggests the similarity of catalytic effect in each of the two cases. Other investigators have noted under similar conditions a maximum activity at 600 to 620 deg. C., (*11*).

The results secured in the different runs in which iron compounds are present cannot be directly compared, because the physical condition and previous history of the compounds are determining factors, and these are never exactly the same in the different runs. It should be pointed out that the catalytic effect of iron compounds depends so much upon their physical and chemical state that the conditions of experiment can never be controlled precisely nor constant and reproducible results obtained. In the study of these iron compounds, therefore, the results cannot be considered alone, but only in comparison with other results under conditions as nearly the same as possible. However, the results do show trends, such as the effect of temperature and gas composition, which are reliable in general character.

It has been pointed out that the catalytic effect of iron compounds is a maximum in the neighborhood of 650 deg. C. In the iron tube, a maximum was found at 750 deg. C. The reason for this behavior is not clear. It may possibly be connected with the abnormal action of iron at elevated temperatures, which will be described later.

The influence of gas composition on sulphur trioxide formation is clearly shown in every case. A high sulphur dioxide content is much less favorable for the formation of trioxide. The possibility of operating the spray burner so that a 19.5 per cent sulphur dioxide gas is produced thus gives it a considerable advantage over the conventional type burner which cannot ordinarily be operated to give over a 16.5 per cent gas.

The results given above cannot be applied directly to the problem of sulphur trioxide formation in pyrite burning, in so far as the iron oxide ash is concerned. It is true that the formation of iron sulphate appears to be necessary for formation of large amounts of trioxide and that a period of one to two hours is necessary to obtain maximum catalytic effect. The rapidity with which the catalytic effect may be developed depends to an unknown degree upon the effect of physical state and of temperature. If any appreciable amount of sulphate is present at any time, the presence of considerable quantities of sulphur trioxide in the burner gases may be expected.

ANALYSIS OF IRON COMPOUNDS AT END OF EXPERIMENTS:

The composition of the final iron products obtained in the experiments just described is of interest in that it may throw some light on the various catalytic activities obtained. The sample in each case consisted of the material in question after runs had been completed at temperatures up to 1000 deg. C. The samples were ground to pass an 80-mesh screen and analyzed for iron by the permanganate method.

The following results were obtained:

(1) Residue from ferrous sulphate ($FeSO_4$)—69.7 per cent iron.
(2) Residue from ferric sulphate ($Fe_2(SO_4)_3$)—69.7 per cent iron.
(3) Residue from pyrites (FeS_2)—60.3 per cent iron.
(4) Scale from interior of iron tube—75.0 per cent iron.

As a comparison, the iron contents of the following compounds are:

(1) Ferrous oxide (FeO)—77.73 per cent iron.
(2) Ferrous-ferric oxide (Fe_3O_4)—72.30 per cent iron.
(3) Ferric oxide (Fe_2O_3)—69.94 per cent iron.
(4) Ferrous sulphide (FeS)—63.53 per cent iron.

The residue from the ferric and ferrous sulphates, therefore, is practically pure ferric oxide. This indicates that the ferrous sulphate was converted to ferric sulphate during the run and that the latter was decomposed at the higher temperatures to give ferric oxide.

The residue from the pyrites contained ferrous sulphide, since considerable hydrogen sulphide was evolved when the sample was treated with acid. The residue was, therefore, probably a mixture of ferrous sulphide and ferrous oxide, with a small proportion of ferric sulphide.

The scale from the iron pipe also contained some ferrous sulphide. It probably consists chiefly of ferrous oxide, with some ferrous sulphide and a little free iron.

The Decomposition of Sulphur Trioxide

In investigating the formation of sulphur trioxide from sulphur dioxide, there is the question of whether trioxide already formed may be decomposed in other parts of the

burner and under what conditions this may take place. Obviously, the amount of trioxide formed during the burning of sulphur is unimportant if it is destroyed in other parts of the burner. The work here described was therefore carried out to determine under what simulated burner conditions sulphur trioxide already formed is decomposed.

APPARATUS USED:

The apparatus used is the same as that used in the study of the formation of sulphur trioxide. Part of the gas stream was now by-passed through the special catalytic furnace so that known mixtures of sulphur dioxide, sulphur trioxide, oxygen, and nitrogen could be produced.

The pyrex glass tube extending through the catalytic furnace was packed with silica gel containing reduced platinum prepared by the method of Holmes, Ramsay, and Elder (*3*), to act as catalytic agent. A 500 deg. C. thermometer extending to the center of the catalytic furnace and in contact with the silica gel served to record the temperature of the furnace. The temperature was kept constant at 460 deg. C., at which temperature almost complete conversion of dioxide to trioxide is obtained.

The composition of the gas mixture was determined after all the gases were mixed and before they passed into the combustion furnace. The du Pont method for the analysis of sulphur trioxide was used.

The decomposition of the trioxide was studied in both silica and iron tubes. As will be described later, the decomposition effect in the iron tube at higher temperatures was entirely obscured by the reaction of the iron with the sulphur dioxide and trioxide.

EXPERIMENTAL RESULTS:

1. Decomposition experiments in fused silica tube:

Two runs were made with the silica tube, covering temperatures from 700 to 1100 deg. C. (1292 to 2012 deg. F.). The results in per cent conversion to sulphur trioxide after passing through the combustion furnace are given and the decomposition of sulphur trioxide for each temperature as calculated from the per cent of sulphur as trioxide before and after passing through the combustion furnace.

After a portion of the original gas mixtures had been by-passed through the catalytic furnace to produce the desired concentration of sulphur trioxide, the resulting gas mixtures were passed through the silica tube in the combustion furnace, and the exit gases analyzed for sulphur trioxide at each of the furnace temperatures indicated.

In Table VII, at 800 deg. C., the amount of sulphur trioxide checks within experimental error with that in the entering gas. Above 800 deg. C. the amount of decomposition increases and at 1100 deg. C. 75 per cent of the trioxide has been decomposed.

The reason for the low result in conversion (apparent decomposition) at 700 deg. C. is not known. It is probably not due to experimental error, since in the study of this particular gas composition two separate runs were made and duplicate samples taken at each point for each of the two runs. All these determinations showed exactly the same trend. The data given in Table VII are the average of the two runs.

TABLE VII

DECOMPOSITION OF SULPHUR TRIOXIDE IN SILICA TUBE

Entering gas contains 2.11% of total sulphur as trioxide.

Temperature in Degrees		Per Cent Conversion after passing through Furnace	Per Cent Decomposition of Sulphur Trioxide
Centigrade	Fahrenheit		
700	1292	148	29.9
800	1472	2.05	2.8
900	1652	1.41	33.2
1000	1832	0.88	58.2
1100	**2012**	**0.52**	**75.3**

Composition of gases before oxidation in catalytic furnace:
20.1 per cent sulphur dioxide
0.9 per cent oxygen
79.0 per cent nitrogen

Composition of above gas mixture after partial oxidation of the dioxide in the catalytic furnace and before passing into the combustion furnace:
19.7 per cent sulphur dioxide
0.4 per cent sulphur trioxide
0.7 per cent oxygen
79.2 per cent nitrogen
(2.11 per cent conversion of dioxide to trioxide)

TABLE VIII

DECOMPOSITION OF SULPHUR TRIOXIDE IN SILICA TUBE

Entering gas contains 7.16% of total sulphur as trioxide.

Temperature in Degrees		Per Cent Conversion after passing through Furnace	Per Cent Decomposition of Sulphur Trioxide
Centigrade	Fahrenheit		
700	1292	7.15	0.1
800	1472	7.40	3.4 (formation)
900	1652	7.27	1.5 (formation)
1000	1832	5.32	25.7
1100	2012	2.90	59.5

Composition of gases before oxidation in catalytic furnace:
15.9 per cent sulphur dioxide
5.1 per cent oxygen
79.0 per cent nitrogen

Composition of above gas mixture after partial oxidation of the dioxide in the catalytic furnace and before passing into the combustion furnace:
14.8 per cent sulphur dioxide
1.1 per cent sulphur trioxide
4.6 per cent oxygen
79.5 per cent nitrogen
(7.16 per cent conversion of dioxide to trioxide.)

As Table VIII shows, no decomposition takes place here at 900 deg. C. and below, while at 1100 deg. C. a maximum decomposition of almost 60 per cent is obtained.

The results given in Tables VII and VIII appear graphically in Fig. 9. The theoretical curves, calculation of which will be given later, are included for comparison. Briefly it may be said that if the experimental points lie below the corresponding theoretical points, no decomposition may be expected. If the experimental points are above, decomposition which has not had time to become complete is indicated.

2. Decomposition experiments in iron tube:

Three runs were made with the iron tube, covering temperatures from 650 to 1000 deg. C. (1202 to 1832 deg. F.). A new tube was used, prepared as previously described by removing the galvanizing zinc from commercial steel pipe.

In all three of the runs made with the iron tube at 650 deg. C. the amount of sulphur trioxide present after the

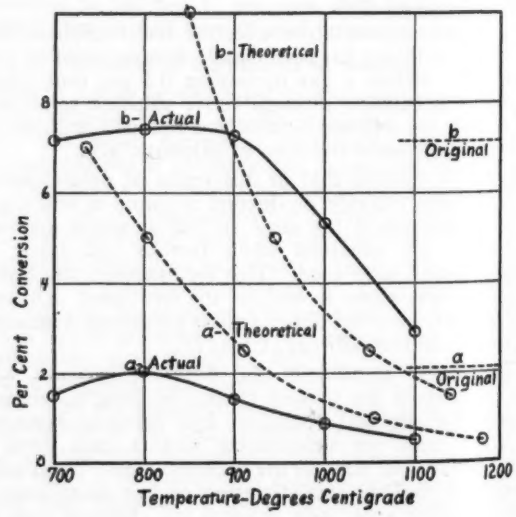

FIG. 9

Decomposition of sulphur trioxide in silica tube. Curve a—2.11 per cent conversion in entering gas, Original SO_3 content—20.1. Curve b—7.16 per cent conversion in entering gas, Original SO_3 content—15.9.

gases had passed through the combustion tube was approximately that present in the entering gas mixture. At this temperature, in the gas containing 9.3 per cent sulphur dioxide and 1.3 per cent sulphur trioxide, a small amount of the sulphur dioxide was apparently oxidized to the trioxide in addition to the oxidation which had previously taken place in the catalytic furnace.

At 750 deg. C. there was a considerable further oxidation of the sulphur dioxide, except in the case of the 19.6 per cent sulphur dioxide—0.5 per cent sulphur trioxide gas, which showed decomposition at this temperature. The cause of this latter gas not following the general course of the other two mixtures is not clear. Two separate runs were made, with concordant results. The data given in Table IX are the average of the two runs.

At 850 deg. C. the amount of decomposition was fairly large, and at 1000 deg. C. no sulphur trioxide at all was obtained. The complete absence of sulphur trioxide in the exit gases at 1000 deg. C. led to more careful scrutiny, and it was found that sulphur dioxide was also completely absent.

The gas composition being used was 15.0 per cent sulphur dioxide—1.0 per cent sulphur trioxide—4.6 per cent oxygen—79.4 per cent nitrogen. The gas leaving the combustion furnace had not the slightest odor of sulphur dioxide. It did not decolorize a dilute iodine solution through which it was allowed to bubble for one hour, showing the complete absence of sulphur dioxide. Also, it did not change the color of methyl orange in distilled water through which it was allowed to bubble for another one hour period, proving the complete absence of sulphur dioxide, sulphur trioxide, and any other acids.

It is therefore apparent that at 1000 deg. C. iron completely reduces both sulphur dioxide and sulphur trioxide. Probably this effect is present to some extent at 850 deg. C. also. The values given for per cent decomposition of sulphur trioxide therefore have no meaning with reference to the sulphur dioxide-trioxide equilibrium, and express only the absorption of sulphur trioxide by the iron.

The iron tube used was attacked so rapidly that after

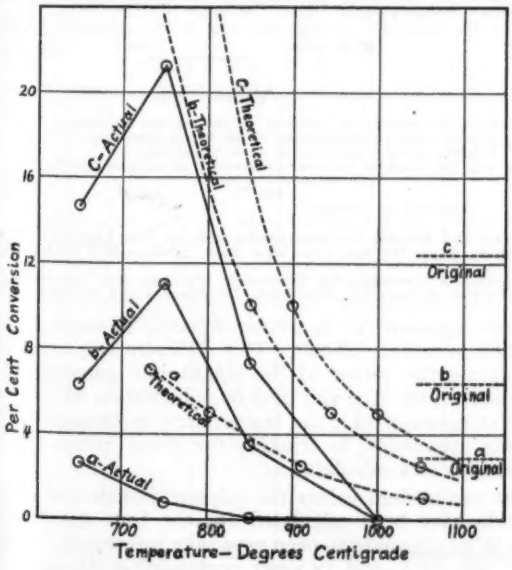

FIG. 10

Decomposition of sulphur trioxide in iron tube. Curve a—2.90 per cent conversion in entering gas. Curve b—6.35 per cent conversion in entering gas. Curve c—12.43 per cent conversion in entering gas.

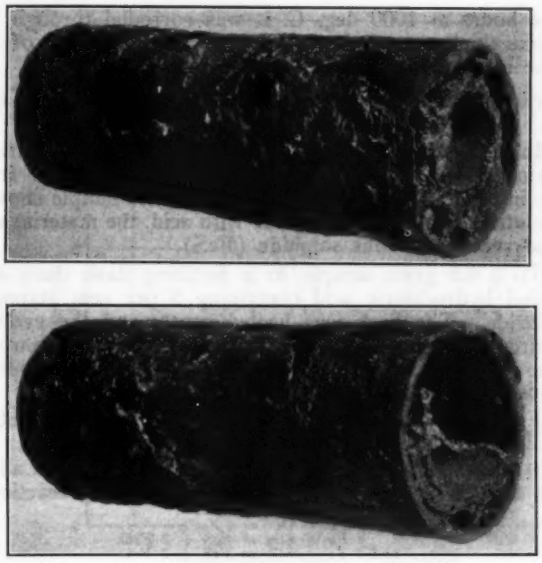

FIG. 11

Condition of iron tube after use.

TABLE IX

DECOMPOSITION OF SULPHUR TRIOXIDE IN IRON TUBE

Entering gas contains 2.90% of total sulphur as trioxide.

Temperature in Degrees		Per Cent Conversion after passing through Furnace	Per Cent Decomposition of Sulphur Trioxide
Centigrade	Fahrenheit		
650	1202	2.65	8.6
750	1382	0.81	72.1
850	1562	0.09	96.8
1000	1832	0.00	100.0

Composition of gases before oxidation in catalytic furnace:
20.1 per cent sulphur dioxide
0.9 per cent oxygen
79.1 per cent nitrogen
Composition of above gas mixture after partial oxidation of the dioxide in the catalytic furnace and before passing into the combustion furnace:
19.6 per cent sulphur dioxide
0.5 per cent sulphur trioxide
0.6 per cent oxygen
79.3 per cent nitrogen
(2.90 per cent conversion of dioxide to trioxide)

TABLE X

DECOMPOSITION OF SULPHUR TRIOXIDE IN IRON TUBE

Entering gas contains 6.35 per cent of total sulphur as trioxide

Temperature in Degrees		Per Cent Conversion after passing through Furnace	Per Cent Decomposition of Sulphur Trioxide
Centigrade	Fahrenheit		
650	1202	6.29	0.9
750	1382	11.02	73.5 (formation)
850	1562	3.46	45.5
1000	1832	0.00	100.0

Composition of gases before oxidation in catalytic furnace:
15.9 per cent sulphur dioxide
5.1 per cent oxygen
79.1 per cent nitrogen
Composition of above gas mixture after partial oxidation of the dioxide in the catalytic furnace and before passing into the combustion furnace:
15.0 per cent sulphur dioxide
1.0 per cent sulphur trioxide
4.6 per cent oxygen
79.4 per cent nitrogen
(6.35 per cent conversion of dioxide to trioxide)

TABLE XI

DECOMPOSITION OF SULPHUR TRIOXIDE IN IRON TUBE

Entering gas contains 12.43% of total sulphur as trioxide.

Temperature in Degrees		Per Cent Conversion after passing through Furnace	Per Cent Decomposition of Sulphur Trioxide
Centigrade	Fahrenheit		
650	1202	14.68	18.1 (formation)
750	1382	21.26	71.0 (formation)
850	1562	7.29	41.3
1000	1832	0.00	100.0

Composition of gases before oxidation in catalytic furnace:
10.5 per cent sulphur dioxide
10.5 per cent oxygen
79.0 per cent nitrogen
Composition of above gas mixture after partial oxidation of the dioxide in the catalytic furnace and before passing into the combustion furnace:
9.3 per cent sulphur dioxide
1.3 per cent sulphur trioxide
9.9 perper cent oxygen
79.5 per cent nitrogen
(12.43 per cent conversion of dioxide to trioxide)

five hours at 1000 deg. C. it was corroded through the entire thickness of the tube wall. The condition of the tube is shown by the photograph in Fig. 11.

ANALYSIS OF IRON TUBE AFTER EXPERIMENTS WERE COMPLETED:

In an attempt to throw some light upon the reactions taking place, an analysis was made on the deposit from the interior of the iron tube. Since a test sample showed evolution of hydrogen sulphide with acid, the material was analyzed for ferrous sulphide (FeS).

To a 0.3 gram sample in a distilling flask there was added hydrochloric acid containing 5 per cent stannous chloride. The flask was heated gently and the evolved hydrogen sulphide distilled into standard iodine solution. The excess iodine was titrated with standard sodium thiosulphate solution.

From the analysis, the residue was found to contain 21.2 per cent ferrous sulphide. If it is assumed that the iron combines with all of the sulphur and also with all of the oxygen present according to the following reactions:

$$2\ Fe + O_2 = 2\text{-}FeO.$$
$$3\ Fe + SO_2 = FeS + 2\ FeO.$$
$$\text{and } 4\ Fe + SO_2 = FeS + 3\ FeO,$$

and that the gas contains 15.9 per cent sulphur dioxide and 5.1 per cent oxygen, then the composition of the residue should be 31.6 per cent FeS and 68.4 per cent FeO. These figures will, of course, vary, depending upon the gas composition. It is probable, therefore, that the residue is FeS and FeO, with some unattacked iron.

SIGNIFICANCE OF DECOMPOSITION EXPERIMENTS:

It is shown that in the presence of silica, sulphur trioxide begins to decompose at 900 deg. C. and that this decomposition reaches the neighborhood of 50 per cent at 1100 deg. C. As is to be expected, the amount remaining after partial decomposition is still greater than the amount formed in the work previously described. The relation of the equilibrium of sulphur dioxide-sulphur trioxide to the amount of trioxide formed by formation and decomposition experiments will be discussed later.

From the practical viewpoint, decomposition of sulphur trioxide already formed cannot be relied upon to keep loss from this source at a reasonable value at temperatures of 1100 deg. C. and below. At 1100 deg. C. the amount of decomposition is not sufficient to reduce the loss to less than 0.5 per cent.

The decomposition of sulphur trioxide to dioxide in the presence of iron is meaningless, since both the dioxide and trioxide react with the iron at elevated temperatures. The above facts also explain the short life of iron in the presence of sulphur oxides under these temperature conditions.

THE CALCULATION OF THE THEORETICAL SULPHUR DIOXIDE TRIOXIDE EQUILIBRIUM:

Any study of the formation or decomposition of sulphur trioxide is not complete without consideration of the equilibrium conditions of the reaction. Although the work as carried out in this study extends beyond the temperatures for which the equilibrium values of the reaction have been accurately determined, nevertheless it is worthwhile to investigate calculated equilibrium values over the range of temperature and gas compositions in which we are especially interested.

The classical work in the field of sulphur trioxide formation is that of Knietsch (*8*), which forms the starting point of all later work. Knietsch investigated the effect of rate of gas flow, temperature, and of various amounts of catalytic materials. However, his conclusion that no sulphur trioxide is formed at temperatures of 1000 deg. C. and above has been shown by later investigators to be in error, although the idea has persisted due to reproduction of the curves obtained by him (*12*).

Among the investigators who have studied the sulphur dioxide-trioxide equilibrium, Bodenstein & Pohl (*1*) have done very careful work. The calculations to be presented in this section are in accordance with their results.

The reaction between sulphur dioxide and oxygen:

$$2\ SO_2 + O_2 = 2\ SO_3$$

is a reversible reaction. This is, sulphur dioxide and oxygen will not combine completely to form sulphur trioxide, nor will the trioxide decompose completely to form the dioxide and oxygen. At any specified temperature, there will be a definite proportion of all three of these substances. Conversely, if any specified proportion of these three substances be chosen, there is a definite temperature at which they are in equilibrium and no further reaction will take place between them.

It is important to distinguish between the equilibrium of the reaction and rate of reaction. The equilibrium relates only to the proportions of the three substances present when equilibrium is finally established, and no further reaction is possible under the conditions designated. The rate of reaction defines the rapidity with which equilibrium is reached.

The rate of reaction depends upon the proportions of the reacting substances and upon the temperature. It also is profoundly affected by catalysts, which speed up the reaction without themselves undergoing change. Catalysts affect only the rate at which equilibrium is attached in a chemical reaction and not the final equilibrium value of the reaction. Well known catalysts for the sulphur dioxide-trioxide reaction are platinum, vanadium pentoxide, and iron oxide.

In order to evaluate the equilibrium proportions of sulphur dioxide, trioxide, and oxygen, the following equations are used:

$$\log K = \frac{4.936}{T} - 4.665 \quad * \qquad (1)$$

where K is the equilibrium constant of the reaction and T is the absolute temperature (temperature in degrees Centigrade + 273).

$$K = \frac{x}{1-x} \cdot \frac{1}{\sqrt{\frac{b - \frac{1}{2}ax}{100 - \frac{1}{2}ax}}} \quad ** \qquad (2)$$

where K is the equilibrium constant of the reaction as before,
a is the initial concentration of SO_2 in per cent,
b is the initial concentration of O_2 in per cent,
and x is the fraction $\frac{\text{(per cent conversion)}}{100}$ of sulphur dioxide converted to trioxide.

* Lewis and Randall, Thermodynamics and the Free Energy of Chemical Substances, pages 294 and 551. New York, McGraw-Hill Book Company, 1923.

** Mellor, A Comprehensive Treatise on Inorganic and Theoretical Chemistry, Volume 10, page 333, New York, Longmans, Green & Company, 1930.

Since equation (2) is a cubic equation in terms of x, its solution is rather difficult. This difficulty was avoided by calculating the values of the equilibrium constant K for assumed values of x and then by substitution of this value of K in equation (1), the temperature corresponding to a definite conversion to trioxide for given initial gas concentrations was calculated.

The equilibrium values for sulphur dioxide and sulphur trioxide have been calculated for the four gas compositions in which we have been especially interested,—namely, 10.5, 14.0, 16.5, and 19.5 per cent sulphur dioxide. The values are plotted in Fig. 12, and in Fig. 13 is shown the lower portion of Fig. 12 on a slightly enlarged scale. Table XII gives the calculated temperatures for the as-

sumed amounts of conversion, while Table XIII gives the per cent conversion at equilibrium, these values being taken from the curves in Figs. 12 and 13.

TABLE XII

CALCULATION OF EQUILIBRIUM TEMPERATURE FOR ASSUMED AMOUNTS OF CONVERSION

Per Cent Conversion	Temperature for Equilibrium, Degrees Centigrade			
	10.5% SO_2 10.5% O_2	14.0% SO_2 7.0% O_2	16.5% SO_2 4.5% O_2	19.5% SO_2* 1.5% O_2
99.0	404	327	....	....
90.0	520	466	....	....
70.0	607	569	....	....
54.5	....	....	438	....
50.0	674	644	568	....
33.3	....	....	670	....
30.0	751	725	....	....
20.0	....	....	749	....
15.38	....	....	....	475
15.25	....	....	....	570
15.0	....	....	....	605
10.0	899	872	842	745
5.0	999	969	937	853
2.5	1111	1077	1041	954
1.0	1289	1246	1202	1100
0.6	1408	....	....	....
0.5	....	1403	....	1229
0.4	....	....	1404	....
0.25	....	....	....	1384
0.2	....	....	....	1440

* Initial gas concentrations.

TABLE XIII

THEORETICAL PER CENT CONVERSION OF SULPHUR DIOXIDE TO SULPHUR TRIOXIDE

Temperature in Degrees		Per Cent Conversion			
Centigrade	Fahrenheit	10.5% SO_2 10.5% O_2	14.0% SO_2 7.0% O_2	16.5% SO_2 4.5% O_2	19.5% SO_2* 1.5% O_2
300	572	100.	99.	55.	15.
400	752	99.	96.	54.	15.
500	932	93.	85.	53.	15.
600	1112	72.	62.	47.	15.
700	1292	43.	36.	27.	12.
800	1472	21.	17.	14.	7.
900	1652	10.	8.2	6.5	3.6
1000	1832	5.	4.0	3.3	1.8
1100	2012	2.8	2.2	1.7	1.0
1200	2192	1.6	1.3	1.0	0.6
1300	2372	1.0	0.8	0.6	0.4
1400	2552	0.6	0.5	0.4	0.2

*Initial gas concentrations.

Significance of Theoretical Equilibrium Data in Relation to Experimental Data:

The data and charts just given on per cent conversion at equilibrium are important in showing the effect of temperature and of gas concentrations on the following:

(a) The maximum amount of sulphur trioxide which can be formed from the reaction of sulphur dioxide and oxygen.

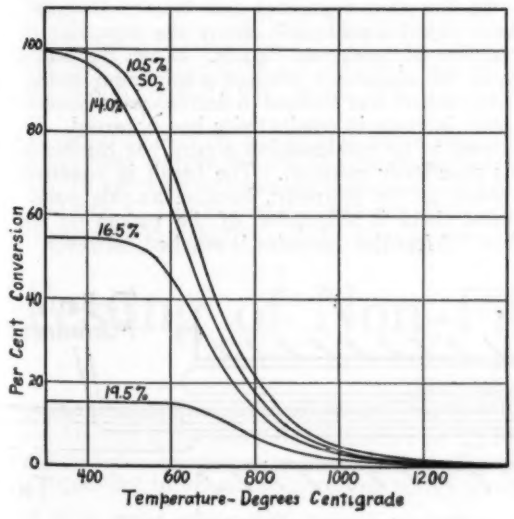

Fig. 12

Theoretical per cent conversion of sulphur dioxide to sulphur trioxide.

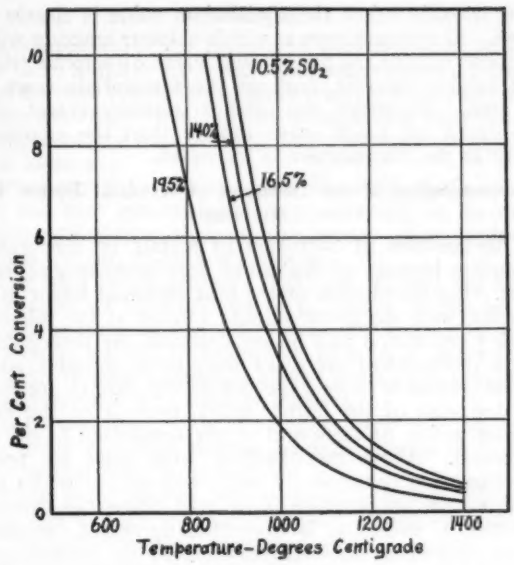

Fig. 13

Theoretical per cent conversion of sulphur dioxide to sulphur trioxide.

(b) The minimum amount of sulphur trioxide which can remain when a gas richer in sulphur trioxide than the sulphur trioxide content at equilibrium is decomposed at elevated temperatures.

The theoretical curves show clearly the reason for the relatively large amounts of sulphur trioxide formed with 10.5 per cent sulphur dioxide, and the decreasing amounts of sulphur trioxide formed as the sulphur dioxide is increased up to 19.5 per cent. In all these cases, the amount of sulphur trioxide formed was far below that found in the equilibrium mixture. This was because the reaction rate was not sufficiently rapid to reach equilibrium under the conditions of experiment. It should be made clear that this investigation has been concerned chiefly with reaction rate under specified arbitrary conditions, and that although we are interested in equilibrium conditions, in practice they are never approached except in the presence of such efficient catalysts as platinum black at its optimum temperature (400 to 500 deg. C.) or at extremely high temperatures (in the order of 1200 to 1400 deg. C.)

Reference to the curve for 15.9 per cent sulphur dioxide in Fig. 9 in comparison with the plotted equilibrium curve shows the relation to be expected. The sulphur trioxide content of the gas is below the equilibrium concentration up to 900 deg. C. at which point the sulphur trioxide content and equilibrium curves cross. Up to this temperature, therefore, no decomposition is to be expected. Above 900 deg. C., decomposition is observed, but the sulphur trioxide content remains above the equilibrium value because sufficient time in the furnace was not allowed for all the sulphur trioxide above the equilibrium value to be decomposed.

The curve for 20.1 per cent sulphur dioxide behaves in an unexpected manner, since decomposition of sulphur trioxide occurs before the equilibrium value is reached. The reason for this is not clear; as previously stated, this run was made twice, taking duplicate samples at each point in each run, and the same results were obtained in both runs.

The equilibrium curves for the runs made in the iron tube are plotted together with experimental results in Fig. 10. In this case, the explanation of the decrease of sul-

phur trioxide below the equilibrium value is clearly indicated. At temperatures at which sulphur trioxide will decompose toward the equilibrium value of sulphur trioxide and sulphur dioxide, both of these materials react with the iron. Therefore, the sulphur trioxide content of the gas drops off much more rapidly than the equilibrium curve as the temperature is increased.

Determination of the Dewpoint of Artificial Burner Gas Mixtures

The question of corrosion of metals by flue gases is important because of the use of heat interchanging equipment. The installation of the heat exchange boiler in conjunction with the spray sulphur burner at the Kimberly-Clark Corporation mill makes desirable the determination of the dewpoint of the gases likely to be encountered.

The corrosion to be expected in any case is greatest at the dewpoint of the burner gases, because of the simultaneous action of scale and of the condensed liquid upon the metal. Above the dewpoint, only gases are present and corrosion therefore is much reduced. On the other hand, as the temperature is reduced below the dewpoint, the rate of corrosion is somewhat decreased because of the slowing up of chemical reactions as the temperature is lowered.

PRINCIPLE OF THE METHOD:

The principle employed for the dewpoint determination is that described by Johnstone (*5*). It is based upon the fact that the electrical resistance between two platinum electrodes sealed into a glass surface is very high in the presence of gases alone. If, however, a condensible gas is present and the temperature of the glass surface is lowered until the dewpoint is reached and a liquid phase begins to form, then the resistance between the electrodes will be markedly decreased. By a simple conductivity measurement between the two electrodes as the temperature of the gases in contact with the glass surface is lowered, the dewpoint or temperature at which liquid first forms can be accurately determined.

APPARATUS:

The apparatus used for preparing known mixtures of sulphur dioxide, sulphur trioxide, oxygen, and nitrogen in the work previously described was employed here. The only alteration was the insertion into the nitrogen line, just after the nitrogen flowmeter, of a flask containing distilled water through which the nitrogen bubbled. By maintaining the flask and water at a certain temperature, a gas containing definite amounts of water vapor was obtained. The moisture content of the nitrogen gas was checked for each run by passing a known volume of the nitrogen and water vapor through a weighed tube containing dehydrite.

The apparatus for the dewpoint determination, while similar in principle to that described by Johnstone, was totally different in construction to suit better our particular

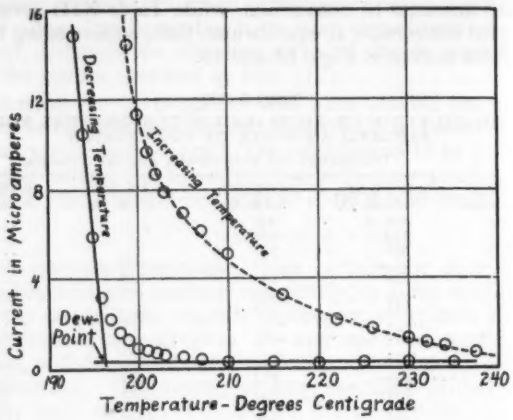

FIG. 15
Method of dewpoint determination.

needs. It was constructed of glass in one piece, the details being shown in the drawing, Fig. 14. It was then placed inside an iron tube inside the combustion furnace previously used. One of the inlet tubes admitted a mixture of sulphur dioxide and sulphur trioxide with oxygen and nitrogen from the air used, while the second inlet tube admitted the mixture of nitrogen and water vapor. These gases met then at the center of the furnace and were mixed by the constrictions placed in the tube. It is necessary to keep the gases separated until a temperature above the dewpoint is reached, since otherwise sulphuric acid will be formed and removed from the gas stream by condensation.

A glass tube sealed inside the larger glass tube allowed introduction of a thermometer, and two platinum wires sealed into the end of this smaller glass tube served as electrodes.

The resistance between the electrodes was measured by connecting them in series with a 1.5 volt dry battery, a variable high resistance, and a microammeter. A tapping key was used to close the circuit when readings were desired.

METHOD OF DETERMINATION:

Gas mixtures of the desired concentration were passed into the dewpoint apparatus and the temperature of the furnace raised considerably above the dewpoint in order to vaporize all condensed liquids. When the conductivity between the electrodes reached a minimum stable value, the temperature was allowed to decrease slowly until a considerable increase in conductivity had occurred.

So long as no condensation occurs, the conductivity remains practically constant. The break in conductivity is not sharp at the dewpoint, because as this point is approached there is adsorption of the vapors on the glass surface. After the dewpoint is reached, however, there is

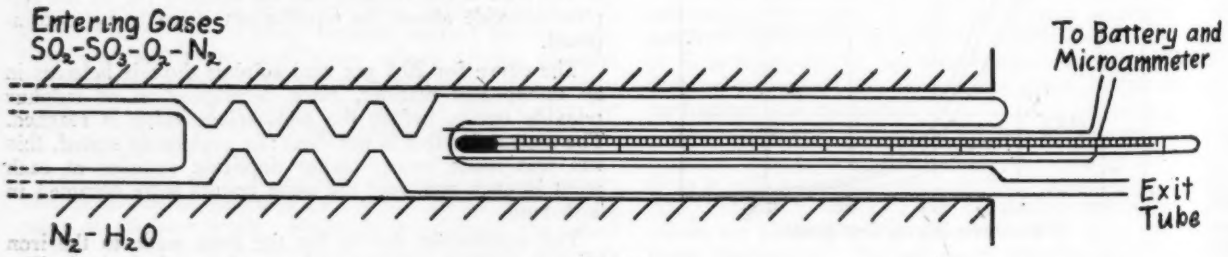

FIG. 14
Apparatus used for dewpoint determination.

a fairly rapid increase in conductivity as the temperature is lowered.

If the conductivity is plotted against temperature, a curve of which that in Fig. 15 is typical is obtained. The region of adsorption is clearly shown. This region makes exact definition of the dewpoint somewhat difficult. However, if straight lines are drawn through the conductivities both above and below the dewpoint region, the point of intersection may be taken as the dewpoint. This method gives reproducible results, and is entirely dependable if it is recognized that vapor adsorption may take place at temperatures slightly above the dewpoint.

In the determination as here outlined, it is necessary that the conductivity be determined as the temperature is reduced. If readings be taken with increasing temperature, a sharp break is not obtained due to the time lag in evaporating the condensed liquid. A series of readings taken with increasing temperature is shown for comparison in Fig. 15.

RESULTS:

The dewpoints here given were obtained by the graphical method described above. Two runs were made with each gas composition, and the average result taken as the dewpoint.

Of the various values of dewpoint obtained, the dewpoint of 14.0 per cent gas and 1.31 per cent conversion reaches 196 deg. C. under humidity conditions more severe than any likely to be encountered in practice. For the 19.5 per cent sulphur dioxide gas and 0.27 per cent conversion (spray burner conditions), the maximum dewpoint was 183 deg. C. (361 deg. F.).

TABLE XIV

DEWPOINT OF ARTIFICIAL SULPHUR BURNER GAS MIXTURES

Approximate Operating Conditions			Composition of Gas Mixture					Dewpoint	
Per cent SO_2	Per cent Conversion	Humidity corresponding to:	Per cent SO_2	Per cent SO_3	Per cent O_2	Per cent N_2	Per cent H_2O	Degrees C.	Degrees F.
14.0	1.31	Dry Gas	13.83	.18	6.92	79.07	0.0	132	270
14.0	1.31	100% at—5.5° C. (22° F.)	13.8	.2	6.9	78.7	0.4	177	351
		50% at 4.0° C. (39° F.)							
14.0	1.31	100% at 18.7° C. (66° F.)	13.5	.2	6.8	77.4	2.1	189	372
		50% at 30.3° C. (86° F.)							
14.0	1.31	100% at 39.0° C. (102° F.)	12.9	.2	6.4	73.6	6.9	196	385
		50% at 52.5° C. (127° F.)							
19.5	.27	Dry Gas	19.45	.05	1.47	79.03	0.0	116	241
19.5	.27	100% at —1.2° C. (30° F.)	19.4	.05	1.5	78.5	0.5	168	334
		50% at 8.7° C. (48° F.)							
19.5	.27	100% at 22.1° C. (72° F.)	19.0	.05	1.4	77.0	2.6	175	347
		50% at 34.0° C. (93° F.)							
19.5	.27	100% at 44.4° C. (112° F.)	17.7	.05	1.3	71.8	9.1	183	361
		50% at 58.4° C. (137° F.)							

For safe operating practice and to keep above the region of adsorption, some margin in operating temperature must be allowed. In any case of ordinary operation, a temperature of 200 deg. C. (approximately 400 deg. F.) should be satisfactory for the conditions of the spray burner.

Conclusions

In a comparison of the spray type sulphur burner of the Texas Gulf Sulphur Company with other types of commercial burners relative to sulphur trioxide formation and the corrosive effect of sulphur trioxide on heat interchanging equipment, the experimental data presented are significant as follows:

1. Irrespective of the materials of which the sulphur burner and heat interchanger are constructed, an increase in sulphur dioxide content of the burner gases leads to decreased sulphur trioxide formation.

2. The high temperature of 2400 deg. F. and the high concentration of sulphur dioxide prevailing in the spray type sulphur burners, limits the maximum amount of sulphur trioxide which can be formed to a value lower than the sulphur trioxide content of burner gases often obtained with conventional type sulphur burners.

3. A burner lined with refractory brick will produce burner gases of lower sulphur trioxide content than the conventional type of iron burner.

4. There is no marked advantage in replacing ordinary steel by special alloy steels such as KA-2 from the standpoint of sulphur trioxide formation.

5. In the operation of the conventional type of sulphur burner, the temperature range at which maximum sulphur trioxide formation occurs in the presence of iron is passed through both while the burner is being brought to its maximum production and while it is being burned down. This may account for the surges of sulphur trioxide which are found at intervals in the cooking liquor.

6. Under certain operating conditions it has been noted that the iron pipe leading from the combustion chamber of the conventional type burner becomes brittle. The experimental work clearly shows that at a temperature of 1000 deg. C. (1832 deg. F.) iron completely reduces both sulphur dioxide and trioxide with the formation of ferrous sulphide and oxide, which may account for the embrittlement. Undoubtedly the same effect will take place to an appreciable extent at somewhat lower temperatures.

7. From the standpoint of avoiding severe corrosion in the heat interchanger, it appears desirable to have the gases leave this point at a temperature not lower than 400 deg. F. to prevent condensation of sulphuric acid.

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Testing of Non-Fibrous Raw Materials*

By Clifford E. Peterson[1]

The Non-Fibrous Raw Materials Committee of TAPPI recently submitted a questionnaire to the pulp and paper industry, requesting information in regard to the testing of non-fibrous materials that are used both directly and indirectly in the manufacture of pulp and paper. Some sixty replies were received which form the basis for this summary.

Table I shows for each material (a) the number of reporting mills, (b) the number that neither test nor buy

* Presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, New York, N. Y., Feb. 18 to 21, 1935.
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on specification, (c) the number that use some specifications but do not test receipts, (d) the number that test receipts but do not have standard specifications, and (e) the number that both test receipts and have standard specifications. The striking feature of this table is the high proportion of mills that use standard specifications of those that test their receipts of materials.

TABLE I

	Reporting Mills (a)	No Test No Spec. (b)	No Test Some Spec. (c)	Test No Spec. (d)	Tests and Spec. (e)
Alum	56	22	8	4	22
Dyes	45	17	2	11	15
Anti-chlors	15	14	0	1	0
Bleach powder	12	4	1	2	5
Casein	12	5	2	1	4
Caustic soda	29	18	2	1	8
Chlorine	43	38	4	0	1
Coal	50	11	4	8	27
Formaldehyde	19	16	1	0	2
Gasoline	24	22	1	0	1
Glue—Coating	3	2	0	1	0
Sizing	15	4	2	2	7
Gluing	12	11	0	0	1
Lime	35	11	2	2	20
Limestone	17	5	1	1	10
Clay, talc, etc.	47	13	3	11	20
Acids	22	18	0	1	3
Oil—Lubricating	37	29	4	0	4
Treating	6	5	1	0	0
Pigments	10	8	0	2	0
Rosin	21	8	2	1	10
Rosin size	32	12	1	4	15
Salt cake	**12**	0	1	1	10
Soda ash	44	28	2	3	11
Silicate of soda	35	27	3	0	5
Starch	39	27	2	3	7
Sulphur	16	8	1	2	5
Waxes—Mineral	12	5	0	1	6
Vegetable	5	5	0	0	0
Animal	1	1	0	0	0

Table II shows a grouping of the materials according to the prevalence of testing. In Group A are found the materials that are tested by less than 25 per cent of the reporting mills. The nature of these materials indicate that the small amount of testing is due to one or more of the following reasons:

TABLE II

Group:	A	B	C	D
Tested by:	(0-25%)	(26-50%)	(51-75%	(76-100%)
	Chlorine	Starch	Rosin	Salt Cake
	Gasoline	Caustic Soda	Wax	
	Anti-chlor	Soda Ash	Rosin Size	
	Glue(Pasting)	Casein	Glue (Sizing)	
	Oil (Lubri-cating)	Sulphur	Limestone	
	Formaldehyde	Alum	Lime	
	Silicate	Glue (Coat-ing)	Dyes	
	Acids		Bleach Powder	
	Pigments		Clay, Talc, etc.	
			Coal	

1. The material is used in relatively small quantity.
2. Quality and uniformity is well established by the supplying manufacturers.
3. Testing methods are difficult or not well established. In Groups B and C are found the materials that are frequently variable in quality, or in the quantity of the valuable constituents. Salt cake is in a class by itself, being tested by 11 out of 12 reporting mills. This table illustrates that, consciously or unconsciously, each mill has some criterion as to whether or not the cost of testing is justified by the results. Such a criterion may consist of the three following questions:

1. Is the material used in large quantities and is its cost of significant proportions?
2. Is the quality of the raw material or the quantity of the valuable ingredient likely to vary considerably?
3. Are tests available that are definitely related to the properties of the material?

For example, in regard to liquid chlorine, the second question would require a negative answer. For this reason, as well as for the difficulty of handling the material in the laboratory, it finds itself in Group A. On the other hand, salt cake would require an affirmative answer to all three questions, thus accounting for its position in Group D.

Table III is presented to show the variety of tests that

TABLE III
TESTS MADE BY VARIOUS MILLS

Alum [26]		Dyes [26]		Casein [5]	
Total Al_2O_3	19	Strength	23	Strength	2
Fe_2O_3	11	Shade or Hue	13	Fat	1
Insolubles	5	Solubility	4	Acidity	1
Basic Al_2O_3	3	Light-Fastness	3	Ash	1
SO_3	2	Acid and Alkali	1	Color	1
Acidity	2	Dirt	1	Solubility	1
Moisture	1	Requirement Test	1	Viscosity	1
FeO	1			Complete	1
Dirt	1				
SiO_2	1				
pH (0.5% solution)	1				
Impurities	1				
Complete	3				
Caustic Soda [9]		**Bleach Powder [7]**		**Formaldehyde [2]**	
Na_2O	9	Available Cl$_2$	7	HCOH	2
Purity	2				
Coal [35]		**Lime [22]**		**Limestone [11]**	
B.t.u.	31	Available CaO	18	CaO	6
Ash	29	Settling Rate	4	Acid Insol.	4
Moisture	11	Ignition Loss	3	MgO	3
Sulphur	10	MgO	2	SiO_2	3
Volatile	7	Fe_2O_3 and Al_2O_3	2	Al_2O_3 and Al_2O_3	2
Fixed C	5	Color	1	CO_2	1
Proximate Analysis	4	Insolubles	1	Moisture	1
Fusing Point of Ash	1	SiO_2	1	Dirt	1
Boiler Test	1	Complete Analysis	4	Complete Analysis	3
Mineral Fillers [31]		**Glue (Sizing) [9]**		**Rosin [11]**	
Grit	14	Viscosity	7	Grade or Color	7
Color	13	Jelly Strength	5	Acid Number	3
Moisture	6	Color	5	Dirt	3
Settling	3	pH	4	Saponification No.	2
Plasticity	1	Ash	2	Melting Point	2
pH	1	Moisture	2	Ash	1
Dust	1	Swelling	1		
Abrasion	1	Clarity	1		
Particle Size	1	Foam	1		
		Water Absorb.	1		
		Dirt	1		
		Keeping Quality	1		
		Odor	1		
		Acidity	1		
Rosin Size [19]		**Salt Cake [11]**		**Soda Ash [14]**	
Total Solids	17	Na_2SO_4	8	Na_2O	11
Free Rosin	8	H_2SO_4	3	Insolubles	3
Total Rosin	5	Insolubles	3	Na_2CO_3	2
Free Alkali	3	Moisture	2	Moisture	2
Ash	1	NaCl	2	Free NaOH	1
Solubility	1	R_2O_3	1		
Dirt	1	Volatiles	1		
Complete Analysis	2	Complete	4		
Silicate [5]		**Starch [10]**		**Sulphur [7]**	
Na_2O	3	Viscosity	5	Moisture	4
SiO_2	2	Color	5	Ash	4
Sp. G. or °Bé.	2	Moisture	4	Sulphur	2
Total Solids	1	Ash	2	Purity	2
Complete	1	Grain Type	2	Combustible	1
Waxes [7]		Cleanliness	2	Cleanliness	1
Melting Point	6	Gelling Temp.	1		
Color	2	Uniformity	1		
Odor	2	Sizing Properties	1		
Taste	1	Clarity	1		
Tensile Strength	1	pH	1		
Total Wax	1	Acidity or Alkalinity	1		

are considered important by different laboratories. The figures in brackets after the raw material represents the number of reporting mills that test receipts, and the figure following each test shows the number of mills using that test. In some cases, "complete tests" or "everything" was reported and these have been entered separately. While requirements may vary from mill to mill, this table should be of value in determining which tests are of sufficient importance to warrant their inclusion in specifications. For example, 23 mills report testing dyes for tinctorial strength. Such a test might well be included among the standard tests of TAPPI, and as such be used in specifying color strength. Also some of the tests reported by one or two laboratories may be novel or special tests that are worthy of committee work and ultimate adoption as a standard TAPPI test.

The questionnaire has shown the need of establishing standard methods for evaluating the properties of dyes, sodium silicate, sizing glues, rosin size, starches and waxes. This information, together with the various types of tests now being used throughout the industry for each of the above materials, has been submitted to the Non-Fibrous Materials Testing Committee for further action.

Acknowledgment

This committee desires to express its sincere appreciation to all who aided in this survey by filling out and returning the questionnaire.

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WEEK ENDING MAY 4, 1935

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Globe Shipping Co., Washington, Havre, 2 cs.

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Van Oppen & Co., Excalibur, Marseilles, 10 cs.

PASTE BOARD

R. Reiner, Stuttgart, Bremen, 5 cs.; Phoenix Shipping Co., Washington, Hamburg, 27 bls.; ———, Deutschland, Hamburg, 61 cs.

MISCELLANEOUS PAPER

Japan Paper Co., Excalibur, Genoa, 4 cs.; Keller Dorian Paper Co., Excalibur, Marseilles, 3 cs.; Walker, Goulard, Plehn Co., Edam, Rotterdam, 10 bls.; T. N. Fairbanks, Tai Ping Yang, Yokohama, 15 cs.; J. M. McDonald Import Co., by same, 5 cs.; F. C. Strype, Deutschland, Hamburg, 6 cs.

RAGS, BAGGINGS, ETC.

Mitsui & Co., Ltd., Tokai Maru, Nagoya, 133 bls. rags; Philadelphia Natl. Bank, Navemar, Barcelona, 101 bls. rags; S. Birkenstein & Son, by same, 189 bls. rags; G. W. Millar & Co., Navemar, Valencia, 410 bls. rags; E. J. Keller Co., Inc., Cold Harbor, ———, 46 bls. paper stock; Castle & Overton, Inc., Cold Harbor, Dundee, 54 bls. paper stock; ———, Amer. Banker, London, 21 bls. rags; E. J. Keller Co., Inc., Excalibur, ———, 92 bls. bagging; do, by same, 60 bls. paper stock; Manufacturers Trust Co., Oriente, Havana, 624 bags new cuttings; ———, Alberta, Trieste, 22 bls. bagging; Amtorg Trading Corp., F. Engels, Odessa, 1410 bls. rags; ———, Washington, Havre, 100 bls. bagging; H. Schimmel, Cuba Maru, Kobe, 125 bls. cotton waste; ———, by same, 470 bls. cotton waste; A. W. Fenton, Inc., City of Flint, Manchester, 17 bls. bagging; Darmstadt, Scott & Courtney, by same, 103 bls. rags; ———, Exermont, Barcelona, 67 bls. bagging; ———, by

same, 188 bls. picker waste; Banco Coml. Italiane Trust Co., Exermont, Naples, 41 bls. rags; E. J. Keller Co., Inc., Tai Ping Yang, ———, 750 bls. rags; Chase National Bank, Tai Ping Yang, Kobe, 90 bls. rags; Banco Coml. Italiane Trust Co., Black Falcon, Antwerp, 131 bls. bagging; Royal Manfg. Co., by same, 108 bls. cotton waste; Loumar Textile By-Products Co., by same, 207 bls. jute waste; Sheffler Mdse. Co., Inc., by same, 10 bls. cotton waste; N. Schwab, by same, 19 bls. cotton waste; Manufacturers Trust Co., Deutschland, Hamburg, 239 bls. cotton waste; Royal Manfg. Co., by same, 258 bls. cotton waste; Philadelphia Natl. Bank, by same, 58 bls. cotton waste; Chase National Bank, Pr. Harding, Havre; 165 bls. bagging; E. J. Keller Co., Inc., Liberty, ———, 47 bls. rags; do, Pr. Garfield, ———, 110 bls. paper stock; do, by same, 55 bls. bagging; do, Exilona, ———, 340 bls. paper stock; do, Blommersdyk, ———, 75 bls. paper stock.

HIDE GLUE

———, Stuttgart, Bremen, 220 bags.

CASEIN

———, Deutschland, Hamburg, 60 bags.

OLD ROPE

Banco Coml. Italiane Trust Co., Edam, Rotterdam, 275 coils; ———, Alberta, Trieste, 81 bls.

CHINA CLAY

English China Clays Sales Corp., Hellenus, Liverpool, 196 bags; ———, by same, 25 casks.

WOOD PULP

———, Pr. Harding, Hamburg, 100 bls. wood pulp, 10 tons; Castle & Overton, Inc., Blankaholm, Kotka, 819 bls. sulphite, 163 tons; Lagerlöef Trading Co., by same, 772 bls. sulphate, 146 tons; do, by same, 4154 bls. sulphite, 730 tons; ———, Washington, Hamburg, 100 bls. wood pulp, 14 tons; M. Sone, by same, 250 bls. wood pulp, 51 tons; E. J. Keller Co., Inc., Washington, ———, 323 bls. wood pulp; Bank of N. Y. Trust Co., Deutschland, Hamburg, 1120 bls. wood pulp, 224 tons; Castle & Overton, Inc., by same, 385 bls. wood pulp, 77 tons.

WOOD PULP WASTE RESIDUE

R. Firman, Amer. Banker, London, 10 drums.

WOOD PULP BOARDS

Lagerloef Trading Co., Blankaholm, Kotka, 14 bls.; ———, by same, 225 bls.

BOSTON IMPORTS

WEEK ENDING MAY 4, 1935

Beacon Wiper Supply Co., Edam, Rotterdam, 110 bls. rags; Castle & Overton, Inc., by same, 1051 bls. wood pulp; E. J. Keller Co., Inc., Tai Ping Yang, ———, 200 bls. rags; Elliott Addressing Machine Co., Tai Ping Yang, Yokohama, 6 cs. paper; E. Butterworth & Co., Inc., Black Falcon, Antwerp, 79 bls. bagging; Royal Manfg. Co., by same, 201 bls. cotton waste; Irving Trust Co., by same, 56 bls. bagging; Elliott & Co., by same, 13 cs. drawing paper; E. J. Keller Co., Inc., Schwarzwald, ———, 336 bls. paper stock.

PORTLAND IMPORTS

WEEK ENDING MAY 4, 1935

Gotesman & Co., Inc., Hjelmaren, Sweden, 1750 bls. wood pulp.

NORFOLK IMPORTS

WEEK ENDING MAY 4, 1935

E. J. Keller Co., Inc., Black Tern, ———, 206 bls. flax-waste; Darmstadt, Scott & Courtney, Black Tern, Antwerp, 167 bls. flax waste; ———, City of Flint, Liverpool, 68 bls. bagging.

NEWPORT NEWS IMPORTS

WEEK ENDING MAY 4, 1935

Gottesman & Co., Inc., City of Hamburg, Sweden, 610 bls. wood pulp.

PHILADELPHIA IMPORTS

WEEK ENDING MAY 4, 1935

———, Blankaholm, Kotka, 75 bls. wood pulp boards; ———, Cold Harbor, London, 158 coils old rope; Chase National Bank, by same, 42 bls. old rope; Castle & Overton, Inc., Uruguayo, B. Ayres, 69 bls. paper stock; ———, Cuba Maru, Kobe, 123 bls. rags; ———, by same, 200 bls. cotton waste; American Cotton Products Co., by same, 100 bls. cotton waste; N. Schwab & Son, by same, 50 bls. cotton waste; Union Waste Co., by same, 35 bls. rags; E. Butterworth & Co., Inc., City of Flint, Manchester, 64 bls. bagging; A. W. Fenton, Inc., by same, 17 bls. bagging; J. H. Weil Co., City of Flint, Liverpool, 4 cs. paper; Union Waste Co., Tai Ping Yang, Kobe, 55 bls. rags; ———, by same, 50 bls. cotton waste; Iwai & Co., Kirishima Maru, Kobe, 40 cs. transparent paper; Gottesman & Co., Inc., Argosy, Finland, 500 bls. wood pulp.

BALTIMORE IMPORTS

WEEK ENDING MAY 4, 1935

S. Shapiro & Co., Cold Harbor, London, 19 bls. rags; ———, Cuba Maru, Kobe, 250 bls. rags; ———, City of Flint, Liverpool, 125 coils old rope; Castle & Overton, Inc., Exermont, Marseilles, 86 bls. rags; Congoleum-Nairn Co., by same, 1308 bls. rags; B. C. Pulp & Paper Co., C. H. Cramp, Port Alice, 3040 bls. sulphite pulp, 545 tons; Gottesman & Co., Inc., Vasaholm, Sweden, 2735 bls. wood pulp.

Abitibi's Report Reveals Encouraging Gains

(Continued from page 11)

and when earned." Recent Ontario legislation requiring only a majority vote will serve to facilitate reorganization, which would otherwise have required one hundred per cent in its favor. Profits of the company, during the entire three years, under receiver, were $431,818 or an average rate of 1.44 per cent on the first mortgage issue. The receiver has provided fully for maintenance, so that depreciation requirements for the period should not be heavy. A favorable aspect of the reorganization is that the plant is a low cost enterprise.

The Manitoba Paper Company, Pine Falls, Man., which has been idle for a considerable time but is expected to resume operations this fall in the making of newsprint and is a subsidiary of the Abitibi Power and Paper Company, had expenses in the shut-down period of $62,793, thus reducing the favorable profit and loss balance carried forward to $2,167,941. The balance sheet shows current assets of $359,567 and current liabilities of $23,014. Other assets than current, including deposits with trustees for bondholders, were $29,937; fixed assets, $9,880,859, and timber limits, $6,151,314, making total assets of $16,419,677.

Cargoes of newsprint will be shipped regularly during navigation from the plant of the Great Lakes Paper Company, at Fort William, Ont., to Chicago and other points. The first steamer of the season left lately for Chicago, loaded with 1400 tons of newsprint.

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, May 8, 1935,

Conditions in the local paper market are satisfactory for the time of year. Demand for the various standard grades of paper is fairly persistent. Sales forces of the leading paper organizations are generally optimistic regarding the future outlook. Prices are holding to previously quoted levels, in most instances.

The newsprint paper market continues active. Circulations and advertising lineage of the leading newspapers are running ahead of the preceding year's record. Manufacturing operations in the North American mills are being maintained in ample volume to meet current requirements. The price situation is unchanged.

Trading in the fine paper market is brisk. Book, cover, writing and ledger papers are moving freely. Prices are steady to firm. Demand for tissues is fairly heavy. The coarse paper market is showing signs of improvement. Prices are generally well maintained. The paper board market is moderately active. Prices are steady.

Mechanical Pulp

The position of the ground wood pulp market is practically unchanged. Production in the United States, Canada and abroad is proceeding in satisfactory volume for the season. Accumulations at the mills are not above normal, with the result that quotations on both foreign and domestic mechanical pulp are holding up well.

Chemical Pulp

Steadiness prevails in the chemical pulp market. Some good sized sales have been made during the past two weeks. Inquiries for future account are fairly numerous and the outlook for the immediate future is encouraging. Kraft pulp continues to exhibit a strong undertone, while other grades are firm.

Old Rope and Bagging

The old rope market is only moderately active at present. Demand for domestic and imported old manila rope is restricted. Small mixed rope is quiet. Old rope prices remain unchanged. The bagging market is marking time. Both gunny and scrap bagging are in seasonal request. Roofing bagging is holding its own.

Rags

Paper mill demand for domestic rags is about normal for the season. Several grades are in good request for export, including No. 1 white shirt cuttings. Roofing rags are moving in good volume. The imported rag market is still affected by fluctuations in foreign currencies, and quotations, in most instances, are nominal.

Waste Paper

The local paper stock market is displaying greater strength. Board mill demand for the lower grades is more insistent, especially for No. 1 mixed paper. Prices remain unchanged. The higher grades of waste paper are fairly steady, including hard white envelope cuttings and hard and soft white shavings.

Twine

There were no further changes reported in the twine market during the past week. Demand for the various varieties is well up to average for the season. Supplies are moving into consumption in good volume. Prices are being maintained at recently quoted levels and reports of concessions are infrequent.

Exemption Asked for Waterproof Paper Manufacturers Doing Less Than $5,000

Members of the waterproof paper industry doing an annual business of less than $5,000 would not be required to contribute to the administration expenses of the code under a plan submitted for NRA approval by the industry's Code Authority.

An NRA order issued October 15, 1934, terminated the exemption conferred by Administrative Order X-36, and all members of the industry were required to contribute to the code fund regardless of whether the waterproof paper code covered their principal line of business.

The Code Authority now proposes that the order be revised to exempt members doing less than $5,000 annual business. The twelve months immediately preceding the approval of the budget would be the period in which the business volume would be computed.

Suggestions or objections concerning the application for amendment must be submitted to Deputy Administrator W. J. Brown, Room 209, National Savings and Trust Building, Washington, prior to May 16.

Complaint Against Samson Paper Corp.

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., May 8, 1935—Alleging unfair competition in the sale of paper products, the Federal Trade Commission has issued a complaint against Samson Paper Products Corporation and Louis, Harry and Moe Hyman, 118 Greene street, New York City, dealers in roll paper.

Adding machine paper was advertised as "Number I Sulphite Bond," indicating a high grade when in fact it was inferior to that known as Number 1 Sulphite Bond. This practice was alleged to be unfair competition with other dealers.

The Commission has given the respondent until Friday, June 7, to show cause why an order to cease and desist from the practices alleged should not be issued.

Tissue Co. Elects Officers

SAUGERTIES, N. Y., May 6, 1935—The Tissue Company of this town at its annual meeting held May 3, elected the following officers: Holley R. Cantine, president; Charles H. Coons, vice president; David L. Maxwell, treasurer and James Dederick, secretary.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, May 8, 1935.

BLANC FIXE.—The position of the blanc fixe market is practically unchanged. Prices are generally well maintained. The pulp is quoted at from $42.50 to $45 per ton, in bulk; while the powder is selling at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER.—Steadiness prevails in the bleaching powder market. The contract movement is fairly satisfactory. Prices are holding to previously quoted levels. Bleaching powder is quoted at from $1.90 to $2.15 per 100 pounds, in drums, at works.

CASEIN.—The casein market is quiet. Domestic standard ground is quoted at 12 and finely ground at 12½; Argentine standard ground at 13 and finely ground at 13¼; French standard ground at 13¼ and finely ground at 13½ cents per pound, in bags, car lot quantities.

CAUSTIC SODA.—Demand for caustic soda is fairly persistent. The contract movement is normal for the season. Solid caustic soda is quoted at from $2.60 to $3.10; while the flake and ground are selling at from $3 to $3.05 per 100 pounds, in drums, at works.

CHINA CLAY.—The china clay market is moderately active. Contract shipments are going forward at a steady pace. Imported china clay is quoted at from $13.50 to $21 per ton, ship side; while domestic paper making clay is selling at from $6.50 to $12 per ton, at works.

CHLORINE.—Business in the chlorine market is fairly brisk. The contract movement is well up to average. Prices are holding to schedule. Chlorine is quoted at from $2 to $2.40 per 100 pounds, in tanks, or multi-unit cars, in ton lots, or over, at works.

ROSIN.—The rosin market continues steady. Paper making gum rosin is quoted at $4.45 and wood rosin at $4.35 per 280 pounds, gross weight, in barrels, at Savannah. Seventy per cent rosin size is selling at $2.58 per 100 pounds, in tank cars, at works.

SALT CAKE.—Conditions in the salt cake market are fairly satisfactory. Prices are steady. Salt cake is quoted at from $12 to $13 and chrome salt cake at from $11 to $12 per ton, at works. Imported salt cake is selling at from $12 to $13 per ton, on dock.

SODA ASH.—The soda ash market continues to exhibit a strong undertone. Contract shipments are moving regularly. Prices are firm. Quotations on soda ash, in car lots, at works, per 100 pounds, are as follows: in bulk, $1.05; in bags, $1.20; and in barrels, $1.50.

STARCH.—No radical changes transpired in the starch market. The recently revised quotations are maintained. The prevailing demand is fairly good. Special paper making starch is quoted at $3.59 per 100 pounds, in bags; and at $3.86 per 100 pounds, in barrels, at works.

SULPHATE OF ALUMINA.—The sulphate of alumina market is displaying strength. Prices are holding to schedule without difficulty. Commercial grades are quoted at from $1.35 to $1.50; while iron free is selling at from $1.90 to $2.05 per 100 pounds, in barrels, at works.

SULPHUR.—The sulphur market continues steady. Sulphur is quoted at $18 per long ton on orders of 1,000 tons, or over, on yearly contracts; and at $20 per ton on any smaller quantity. On spot and near-by car loads, the quotation is $21 per ton.

TALC.—Demand for talc is normal for the time of year. Prices are maintained at formerly quoted levels, in most instances. Domestic talc is quoted at from $16 to $18 per ton, at eastern mines; while imported talc is selling at from $23 to $30 per ton, on dock.

Market Quotations

Paper

(F. o. b. Mill)

Ledgers	6.50	@	—
Bonds	6.00	@	—
Index	6.00	@	—
Writings—			
Extra Superfine	6.50	@	—
Superfine	6.25	@	—
Tub sized	5.75	@	—
Engine sized	5.50	@	—
Book, Cased—			
S. & S. C.	5.35	@	5.75
S. & S. C. Litho	5.60	@	6.00
M. F.	5.10	@	5.50
Coated and Enamel	5.90	@	6.55
Coated Litho	5.90	@	6.55
Tissues—Per Ream—			
White No. 1	.82½	@	.85
White No. 2	.67½	@	—
Anti-Tarnish M. G. only	1.00	@	—
Colored	.85	@	—
Kraft	.70	@	—
Manila	.67½	@	.70
Manila—			
No. 1 Jute	9.00	@	9.25
No. 2 Jute	7.75	@	8.50
No. 1 Wood	4.00	@	5.25
No. 2 Wood	3.50	@	4.00
Butchers	4.00	@	4.50
Fibre Papers—			
No. 1 Fibre	4.25	@	5.50
No. 2 Fibre	4.00	@	4.75
Common Bogus	1.50	@	3.00
Screenings	2.50	@	3.50
Glassine—			
Bleached	.11	@	—
Unbleached	.09	@	—

(The following Quotations are Delivered New York)

News, per ton—			
Roll, contract	40.00	@	—
Rolls, spot	40.00	@	—
Sheets	45.00	@	—
Kraft—			
No. 1 Northern	4.12½	@	4.75
Standard	4.00	@	—
Southern	3.87½	@	—
Boards—per ton—			
News	37.50	@	40.00
Chip	35.00	@	37.50
Sgl. Mla. Ll. Chip	45.00	@	47.50
Jute Lined Chip	45.00	@	47.50
White Patent Coated	55.00	@	57.50
Binders Boards	67.00	@	75.00

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	21.00	@	22.00
Dry	21.00	@	22.00
(F.o.b. Mill)			
No. 1 Domestic and Canadian	18.00	@	24.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Division 1	2.60	@	—*
Division 2	2.55	@	—*
Division 3	2.50	@	—*
Prime Qualities—			
Class 1. All Prime Easy Bleaching	2.05	@	—*
Other Than Easy Bleaching—			
Class 2. Higher Than Standard	2.00	@	—*
Class 3, Standard	1.95	@	—*
Class 4, Lower than Standard	1.90	@	—
(On Dock, Atlantic Ports)			
Kraft No. 1	1.70	@	1.80
Kraft No. 2	1.50	@	1.60
(F.o.b. Pulp Mill)			
Kraft Domestic	1.70	@	2.35
(Delivered)			
Soda Bleached	2.50	@	—

*Add 60 Cents per short ton, dock charges, for Albany; $2.00 for Lake Ports East and $3.00 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	5.75	@	6.00
Silesias No. 1	3.75	@	4.00
New Unbleached	6.25	@	6.50
New Soft Blacks	3.00	@	3.25
Blue Overall	3.50	@	3.75
Fancy	2.50	@	2.75
Washables	1.75	@	2.00
Mixed Khaki Cuttings	3.00	@	3.25
O. D. Khaki Cuttings	3.75	@	4.00
Men's Corduroy	1.50	@	1.75
New Mixed Blacks	2.50	@	2.75

Old Rags

White, No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.75	@	3.25
White, No. 2—			
Repacked	1.75	@	2.25
Miscellaneous	1.50	@	1.75
Thirds and Blues—			
Repacked	1.50	@	1.75
Miscellaneous	1.25	@	1.50
Black Stockings	2.50	@	3.00
Roofing Rags—			
No. 1	1.22	@	1.30
No. 2	1.10	@	1.15
No. 3	.95	@	1.00
No. 4	.95	@	1.00
No. 5A	.80	@	.85

Foreign Rags

New Rags

New Dark Cuttings	1.75	@	1.85
New Mixed Cuttings	1.80	@	1.90
New Light Silesias	3.75	@	4.00
Light Flannelettes	3.75	@	4.00
Unbleached Cuttings	6.50	@	6.75
New White Cuttings	6.56	@	6.75
New Light Oxfords	3.25	@	3.50
New Light Prints	2.75	@	3.00

Old Rags

No. 1 White Linens	7.50	@	8.00
No. 2 White Linens	6.50	@	7.00
No. 3 White Linens	4.50	@	5.00
No. 4 White Linens	2.25	@	2.50
No. 1 White Cotton	4.25	@	4.75
No. 2 White Cotton	3.25	@	3.75
No. 3 White Cotton	2.50	@	2.75
No. 4 White Cotton	1.90	@	2.15
Extra Light Prints	2.00	@	2.25
Ord. Light Prints	1.75	@	1.85
Med. Light Prints	1.55	@	1.65
Dutch Blue Cottons	1.75	@	1.85
French Blue Linens	2.30	@	2.40
German Blue Linens	2.15	@	2.25
German Blue Cottons	1.70	@	1.80
Checks and Blues	1.30	@	1.40
Linsey Garments	1.50	@	1.65
Dark Cottons	1.15	@	1.25
Old Shopperies	1.00	@	1.05
New Shopperies	.95	@	1.05
French Blues	1.70	@	1.80

Old Rope and Bagging

(Prices to Mill f. o. b. N. Y.)

Gunny No. 1—			
Foreign	1.50	@	1.60
Domestic	1.40	@	1.50
Wool Tares, light	1.40	@	1.50
Wool Tares, heavy	1.50	@	1.60
Bright Bagging	1.40	@	1.50
Manila Rope—			
Foreign	1.85	@	2.00
Domestic	1.75	@	2.00
Small Mixed Rope	1.10	@	1.15
New Burlap Cut	2.00	@	2.25
Hessian Jute Threads—			
Foreign	2.60	@	2.75
Domestic	2.80	@	3.00

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.60	@	2.70
Ordinary Hard White No. 1	2.10	@	2.15
Hard White No. 2	1.90	@	2.00
Soft White No. 1	1.70	@	1.80
Flat Stock—			
Stitchless	.65	@	.75
Over issue Mag.	.65	@	.75
Solid Flat Book	.45	@	.50
Crumpled No. 1	.35	@	.40
Solid Book Ledger	1.50	@	1.65
Ledger Stock	1.00	@	1.10
New B. B. Chips	.30	@	.33
Manilas—			
New Env. Cut	1.70	@	1.80
New Cuttings	1.35	@	1.45
Print	Nominal		
Bogus Wrapper	.40	@	.50
Container	Nominal		
Old Kraft Machine—			
Compressed bales	1.10	@	1.20
News—			
No. 1 White News	1.20	@	1.30
Strictly Overissue	.60	@	.65
Strictly Folded	.25	@	.30
No. 1 Mixed Paper	.15	@	.20

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PAPER TRADE JOURNAL

ESTABLISHED 1872

SIXTY-THIRD YEAR

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

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Want and For Sale Advertisements, 64-65

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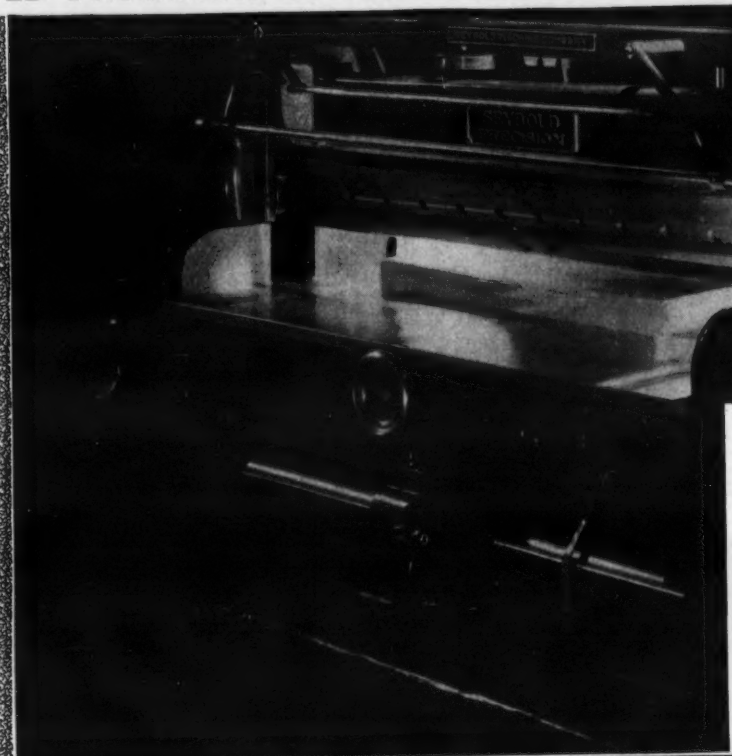

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